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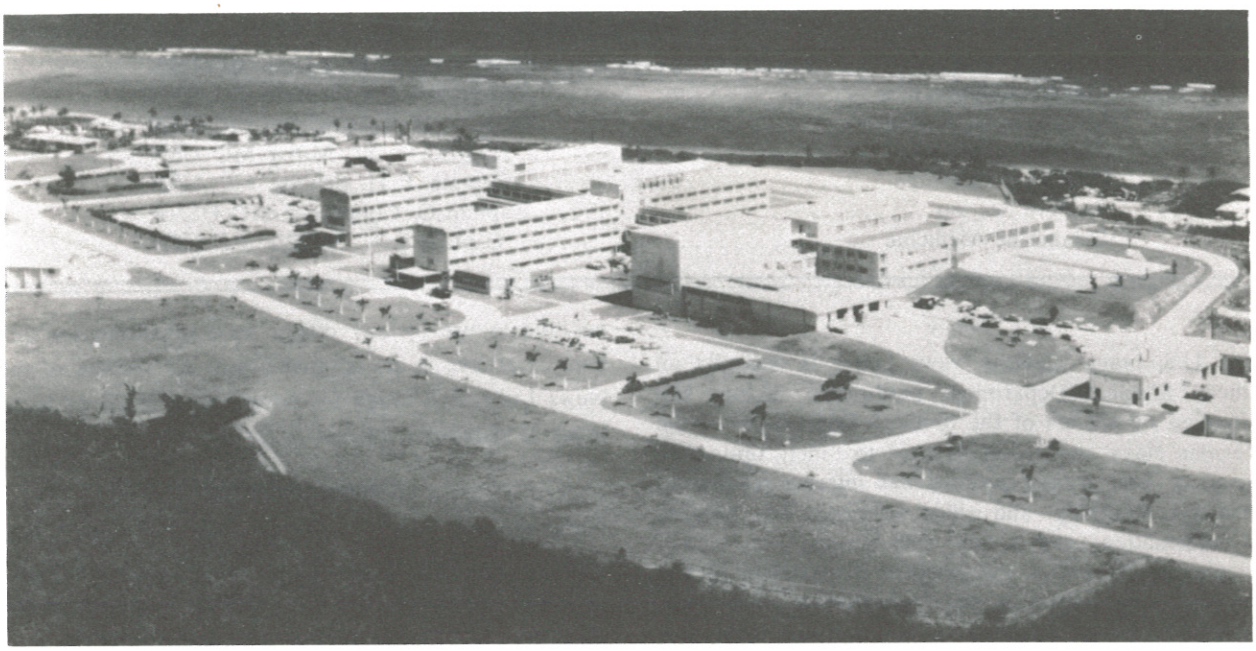

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United States Navy
MEDICAL NEWS LETTER

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Policy

The U.S. Navy Medical News Letter is basically an official Medical Department publication inviting the attention of officers of the Medical Department of the Regular Navy and Naval Reserve to timely up-to-date items of official and professional interest relative to medicine, dentistry, and allied sciences. The amount of information used is only that necessary to inform adequately officers of the Medical Department of the existence and source of such information. The items used are neither intended to be, nor are they, susceptible to use by any officer as a substitute for any item or article, in its original form. All readers of the News Letter are urged to obtain the original of those items of particular interest to the individual.

Change of Address

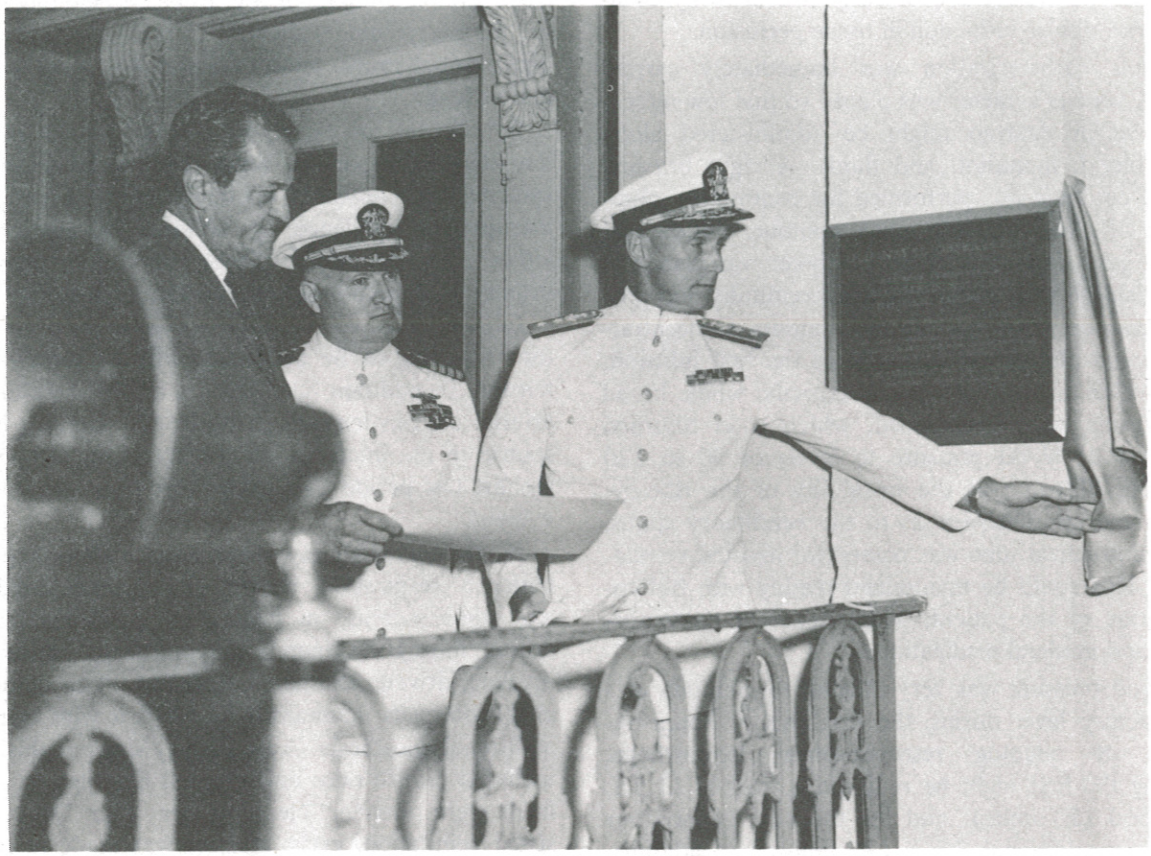
Please forward changes of address for the News Letter to Editor: Bureau of Medicine and Surgery, Navy Department, Washington, D.C. 20390 (Code 18), giving full name, rank, corps, and old and new addresses.

FRONT COVER: U.S. NAVAL HOSPITAL, GUAM, MARIANA ISLANDS. The history of the Navy's Medical Department on Guam began on 20 June 1898, when Passed Assistant Surgeon Ammen Farenholt, medical officer aboard the USS CHARLESTON, landed with the first American Forces on Guam during the Spanish-American War. It was not until the spring of 1899 that a naval occupational organization in the USS YOSEMITE arrived at Guam. The medical officers of the vessel were Surgeon Philip Leach and Assistant Surgeon Alfred G. Grenwell. Thus the first Senior Medical Officer for the Guam area was Surgeon Leach.

During this time Navy sick quarters were established, sanitary regulations were effected throughout Agana and outlying areas and, on 10 June 1901, the cornerstone was laid for the Maria Schroeder hospital in Agana. Staffed by Navy Medical Department personnel, the hospital cared for the indigenous population, military dependents and naval personnel. In 1905 the Susana Hospital for women and children was founded. Professional services again were furnished by the U.S. Navy Medical Department. In the same year islanders were vaccinated against smallpox. Another noteworthy achievement was the establishment in 1918 of a school for the instructions of midwives who were licensed when eligible. From 1905 to 1918 there had been 50 cases of tetanus neonatorum (umbilical cord infection), all of whom died. From 1918 on there were no reports of "cord tetanus." An elementary course in hygiene was instituted in public schools; and a Tuberculosis Hospital was established in 1916 at Agana Heights, near the location of the present hospital.

During the period from December 1941 until July 1944 the island of Guam was occupied by forces of the Japanese Government. Following our re-capture of Guam, Naval medical facilities were established in July 1944 as the U.S. Fleet Hospital, No. 103, later redesignated as U.S. Naval Hospital, Guam in January 1946. In March 1946, the U.S. Naval Medical Center, Guam was commissioned under a Medical Officer in Command and was composed of the following activities: U.S. Naval Hospital; Guam Memorial Hospital; School of Medical Assistants; and School of Dental Assistants. In October 1949, the 22nd Army General Hospital was disestablished and the Navy assumed responsibility for care of all Armed Forces personnel entitled to hospitalization.

The issuance of this publication approved by the Secretary of the Navy on 4 May 1964.



Rear Admiral Robert B. Brown, Surgeon General of the Navy, unveils the plaque designating Building No. 2 of the Bureau of Medicine and Surgery as an historical landmark. Mr. T. Sutton Jett, (left) Regional Director of the National Park Service, made the presentation. The main address was delivered by Captain Joseph M. McDowell (center), Superintendent of the U. S. Naval Observatory.

TERMINAL MECHANISMS IN HUMAN INJURY

Francis D. Moore MD, Boston, Mass. Amer J Surg 110(3): 317–323, September 1965.*

It is a privilege to be asked to discuss this topic in a symposium on circulatory failure because it is only by a critical examination of events in man that one can discern important directions for new work and significant interpretation of laboratory data from other species. It is likewise appropriate to begin with the examination of an individual case. This is always a refreshing discipline in discussions of a subject that tends to lapse into generalities.

Case Report

This is the case of a twenty-eight year old man (L. P. #5–58–69) who fell from a third-story window onto hard pavement. On admission to the hospital he displayed an obvious fracture of the pelvis, some instability of the ribcage, but was conscious and showed normal cranial and spinal reflexes. The

* From the Departments of Surgery, Harvard Medical School and Peter Bent Brigham Hospital, Boston, Mass. This work was carried out with the support of the U.S. Army Medical Research & Development Command.

blood pressure, initially 90/50 mm Hg, fell rapidly to a systolic value of 50 mm Hg. The peripheral appearances were those of early traumatic hypotension with diffuse reduction in tissue perfusion.

Triple catheterization was immediately carried out. A venous catheter was placed so that low molecular weight dextran might be administered along with blood, mannitol, and fluids. A right brachial artery cutdown was performed for continuous monitoring of blood pressure, pulse contour, and arterial blood gas analysis; a urethral catheter was placed to establish the presence of urethral continuity and provide data on short-term urinary outputs. Concentrated human albumin was started as the first infusion, and within a few minutes type-specific whole blood transfusion was commenced, which soon returned the systolic blood pressure to levels of 90 to 120 mm Hg. Because of the instability of the ribcage, and some apprehension as to the ventilatory status, an endotracheal tube was passed for assisted ventilation. This could be maintained readily with full cooperation of the patient, maintenance of consciousness, and minimal medication.

Blood pressure was very difficult to maintain at a satisfactory level during the first twenty hours because of ongoing retroperitoneal hemorrhage. During the first night he required a total of 11.5 L of blood (23 units), and for the next twenty-four hours an additional 7.5 L (15 units) was administered. At no time did any external bleeding occur. Because of apprehension as to thrombocytopenia even though most of his recorded platelet counts were in a normal range, some of the blood administered was given without filtration. Much of this blood was very fresh, less than one hour intervening between withdrawal from the donor and infusion to the patient.

Because of continuing abdominal tenderness an exploratory laparotomy was carried out, demonstrating no visceral rupture or open hypogastric artery but instead a massive pelvic and extraperitoneal hemorrhage arising particularly from the posterior fracture of the blade of the ilium on the left.

Although blood pressure was at normal levels much of the time, the patient was in a low-flow state intermittently with oliguria, tachycardia, and every evidence of maximal adrenocortical and adrenomedullary activity. This continued for approximately forty hours.

The circulation finally stabilized after a total of 21 L of blood had been infused. Because of continuing suspicion of a bleeding tendency he had been given calcium gluconate, epsilon aminocaproic acid, and fibrinogen; laboratory measurement failed to disclose any bleeding tendency. Repeated monitoring of the plasma volume showed it to be in the normal or high normal range. Blood volume was likewise normal or high.

By the end of twenty-four hours it was evident that the patient was in acute renal insufficiency despite priming doses of mannitol and generous fluid therapy; no evidence of ureteral obstruction on either side was noted. There was no response in urinary volume to the increased rate of infusion.

Initially, analysis of blood gases showed respiratory function to be adequate, with a normal CO_2 tension. In addition he showed a normal response of arterial oxygen tension, rising to 470 mm Hg in response to the inhalation of 100 per cent oxygen for a short test period. No physiologic shunt was as yet evident.

By the following day (fourth day after injury) the patient's respiration became increasingly difficult, and some increase in inspiratory pressure was required during his increasingly frequent periods on machine-driven assisted ventilation. The endotracheal tube was maintained in position with minimal additional anesthesia. Auscultatory signs at this time included diffuse rales and rhonchi although the lung fields were relatively clear by x-ray film. During assisted ventilation, every attempt was made to maintain the patient on the lowest possible oxygen tension compatible with satisfactory oxygenation, with maximal humidity in the inspired air, and with several deep breaths or sighing respirations every few minutes.

Urinary output was never resumed. Petechiae over the chest wall suggested fat embolization, but fat was not demonstrable in urine or sputum. Blood pressure continued to fluctuate; norepinephrine and cortisone were added to the infusion. Repeated blood cultures gave negative results. No gastrointestinal bleeding was noted. Abdominal signs continued to show the tenseness associated with a large retroperitoneal hemorrhage. Peristalsis was resumed. There were increasing evidences of peripheral anoxia; pH began to fall and terminally reached a value of 7.12 despite an essentially normal carbon dioxide tension, indicating a mounting base deficit and the accumulation of a large amount of metabolic acid. The terminal event was cessation of the heart beat while blood pressure was precariously maintained close to normal with vasopressors. External manual systole was unavailing. He died on the twelfth day after injury.

Postmortem examination showed multiple fractures of the pelvis with a separation of the symphysis pubis. There was massive retroperitoneal, scrotal, and intra-abdominal hemorrhage estimated by the pathologist to total 3,500 ml. There was acute tubular necrosis bilaterally symmetrical. There was no ureteral obstruction. Neither kidney was ruptured. The lungs showed congestion with increased weight due to the accumulation of interstitial fluid. There was acute aspiration tracheitis and bronchitis, and several areas of beginning pneumonitis. Small fat emboli were present; pneumothorax resulted from manual systole. A disorder of the liver or portal circulation was not evident; slough or hemorrhage into or around the gut mucous membrane at any point was not noted. There were no areas of focal infection although positive cultures for Klebsiella aerobacter could be obtained from the tracheobronchial tree. There was a small area of cerebral infarction in the right frontal lobe compatible with a contrecoup injury or possibly a small cerebral embolus.

Of What Did He Die?

This detailed case history has several points of interest. It is the case of an injury to an otherwise healthy young man; he suffered at one point from unrelieved hypotension, and throughout much of the course from a circulatory disorder in which blood pressure was extremely difficult to maintain even though continued bleeding was not always evident; there was no septic process either focal or general although terminal colonization of the tracheobronchial tree occurred. However, the principal reason for discussing this case at all is to dwell for a moment on the matter of prime causes, the meaning of such causes for research, and the semantics of severe injury.

In 1910 this patient would have been referred to as having died of a fractured pelvis. In 1920 blood transfusions having become available on a small scale, he would have been referred to as having died of hemorrhage even though the previous five years had included Dr. Cannon's beginning trend towards the use of the term "shock" in civilian injuries as so widely applied during World War I[1]. By 1925 this death would quite clearly have been stated to be due to shock. At any time prior to this the patient almost surely would have died in his first ninety-six hours, as liberal blood replacement at this magnitude plus assisted ventilation were not generally available—methods of great value in treatment, yet carrying their own special hazards.

By 1945 the use of the dog preparation for the study of shock had come into wide use because of stimulus by the office of Scientific Research and Development during the war, and again it was noted (as it had been thirty years previously by Cannon in experiments with cats) that unrelieved prolonged hypotension produced a situation that was difficult to reverse. The term "irreversible shock" therefore came into vogue. By careful laboratory study this picture could be defined long before death and included massive hemorrhage from the gut, portal hypertension after retransfusion, a tense swollen liver, failure to regain consciousness over a period of many hours, and frequently the finding at autopsy of multiple small myocardial necroses. This patient had shock and he died, so surely by any definition he was "irreversible"! Furthermore one could assume that his gastrointestinal tract was well populated with colon bacilli, and he seemed to have a requirement of blood far in excess of any measured losses. So, during the period 1945 to 1950, this patient would have been referred to as having died of irreversible shock and that would be considered a good and sufficient cause for anybody to die[2]. Many workers with the wounded in the Korean War began to develop a suspicion of this terminology when it became evident that many wounded men who had been in refractory hypotension for many hours were indeed quite reversible if proper diagnosis and treatment were instituted for focal lesions, and it was discovered, both in World War II and Korea, that inevitable colonization with micro-organisms was not a part of human injury, as it was in the dog.

With description of the crush syndrome by Bywaters in 1943[3] and the increasing recognition of renal failure, closely followed by the development of the artificial kidney, there was increasing awareness of the fact that acute tubular necrosis could be expected in patients who made no urine after severe injury and who had mounting azotemia, elevated potassium (here 6.6 mEq/L), and peaked T-waves in the electrocardiogram, and for this reason there would be good cause to state that this patient died of post-traumatic renal insufficiency[4].

Intermittently since the mid-1930's there has been interest in enzymatic alterations in the low flow state; there is general agreement that prolonged deficiency of flow to cellular organs produces alterations in their enzymatic activity measurable either in the form of abnormal end products such as lactic acid[5,6], in the build-up of abnormal enzymes in the blood such as lactic dehydrogenase and transaminase, or in abnormal enzymatic activities in specific tissues such as kallikrein of pancreas, and in oxidative enzymes

in the mucous membrane of the gut[7]. These cellular changes are the result of prolonged anaerobiosis in cellular tissues. The accumulation of these abnormal metabolic products makes resuscitation difficult, so that one might well state that this patient died of prolonged deficiency of tissue perfusion.

The close monitoring of such a patient permits a number of measurements to be made precisely at the time of death, and by continuous electrocardiographic tracing it becomes evident that most patients at the time of death have cessation of the heart beat prior to cessation of that other vital function without which life is absent, namely, the brain. In looking at the terminal electrocardiogram in such a patient as this, one might be tempted to state that he died of cardiac arrest. Whether the arrest is initially diastolic in character or later becomes ventricular fibrillation is of major importance in resuscitation of more favorable cases but of relatively little interest as to mechanism. In patients such as this, so-called "cardiac arrest" has occurred because the biochemical environment of the heart will not permit normal continued neuromuscular irritability and reactivity. Low coronary perfusion rates with associated changes in the ST segment later compounded by severe anoxia and lactic acidosis produce this cessation of the heart beat; attempts at resuscitation in such cases are futile for the reason they were here, namely, that the altered biochemical environment cannot be normalized by the mere act of restoring the heart beat or pumping the heart as a substitute for normal systole.

To the pathologist schooled in conventional postmortem terminology, there is little doubt that this patient died of some sort of pneumonic process probably aspiration, bronchopneumonia, fat embolism, and pneumothorax. Unquestionable evidence of aspiration was present, there was a mixed pulmonary lesion with some infiltrate, the lungs were heavy, and the transient attempts at cardiac resuscitation had produced a pneumothorax. Organisms had been recovered from the tracheobronchial tree below the vocal cords.

Finally, it would be difficult to exclude the head injury as contributing to the fatality. The precise cause was not wholly clear, and there were no early changes in spinal or cerebral nerve reflexes; the patient had been conscious and very well oriented throughout his first several days. Despite these factors the postmortem findings would include cerebral injury with infarction as a major cause of death.

Only to the most ardent devotee of the canine preparation would it be justified to refer to this patient as having died of endotoxin shock although surely such would be invoked by those who might also employ the term "irreversible shock." It is noteworthy that he had no hepatic engorgement and no evidence of gastrointestinal hemorrhage despite the extensive bleeding in other sites.

Lethal Outcome

Such cases as this are commonplace and in a sense typical; nonetheless it is essential to look at the terminal events in large groups of patients to see if any significant patterns emerge; such efforts have occupied the attention of several laboratories in this country during the past decade. Our initial effort was devoted to the whole population of patients in our hospital suffering from any sort of hemorrhagic, traumatic hypotension, or severe injury. In the course of about eighteen months we readily corroborated the obvious fact that the vast majority of these patients are very easily resuscitated using conventional methods which quickly come to hand[8]. Blood transfusion and proper ventilation are surely the most important. One cannot but look with skepticism at reports of large series of unselected patients in which high survival values are claimed for some agents such as low molecular weight dextran, vasodilators, mannitol, or particular sorts of ventilatory apparatus; any large and unselected group of patients with traumatic hypotension can show a very high survival rate with or without the use of any single drug or machine, providing blood is available and careful clinical diagnosis is maintained.

However, in addition to that large group of easily rescued patients, there was a small hard core of very difficult problems similar to those encountered in the patient just described in some detail. It is this "hard core group" of patients with refractory hypotension with whom all workers today are concerned. These patients were referred to as suffering from "refractory hypotension" as a feature of prolonged deficiency of blood flow, inadequate tissue perfusion, and widespread anaerobiosis. In our first report of patients suffering from refractory hypotension we found that the combination of bloodstream infection with severe pulmonary insufficiency was the most highly lethal; we rediscovered the obvious fact that restoration to normal of some of the biochemical parameters of the blood (such as acidosis) would often make possible the restoration of blood pressure and flow by transfusion[9].

That initial series of studies has been followed by a current group of patients in whom measurements

have been much more discriminating with respect to anaerobic metabolism, the products of that metabolism in the blood, bacteriologic study of the blood, and local infection sites, blood volume, and an attempt to use more rigorous diagnostic methods and terminology in severe injury. Reviewing these cases currently under study, we find that the most common causes of death after severe injury in man or after extensive surgical operations, particularly in persons with disease of heart, lungs, or kidney, are as follows:

1. *An obliterative pneumonitis* as a complication of prolonged low blood flow with multiple blood transfusions; there is anoxia early, hypercarbia late, lactic acidosis with an elevated value for excess lactate, with terminal cessation of the heart beat prior to cessation of other functions. The pathologist finds a lung lesion that is a mixture of atelectasis, pulmonary edema, small pulmonary emboli, bronchopneumonia, and all too frequently aspiration. Fat emboli are sometimes present. Physiologic measurement shows the development of an increasingly significant right to left shunt of blood that is passed through the pulmonary circuit without being oxygenated. The local toxic effects (in the lung) of high oxygen tensions in the inspired air cannot be denied as a possible lethal mechanism in many cases; changes in pulmonary surfactant may be the intermediary mechanism whereby high oxygen tensions alter the compliance and inflatability of the lung. If one seeks a single organ lesion in man that is not readily reversed by treatment, this is it. The bacteriologic picture is compounded by the use of many antibiotics; the tracheobronchial tree is colonized with organisms at death, and it would be almost inconceivable to consider such a trachea as being sterilized by the use of any combination of antibiotics; in most such cases, however, this colonization does not seem to be of primary etiologic importance.

2. In sharp contrast are those patients whose death is clearly due to overwhelming infection with a positive blood culture; blood volume must be supported at values far above normal to support pressure and flow. Pulmonary changes may or may not be present with these patients; some sort of toxemia whether due to an endotoxin or an exotoxin certainly appears to be important in the production of the hypotensive state. It is noteworthy that in our experience to date we have never seen this sequence of hypervolemic septic hypotension in the absence of a positive blood culture. The patient suffering from gram-negative bacteremia comes closest to an approximation of the canine shock preparation with endotoxemia, although many differences are still apparent particularly in the portal circulation.

3. Post-traumatic renal insufficiency is yet another cause. There is a small group in whom the unrelieved renal failure is a predominant and indubitable cause of death; multiple dialyses, even as frequent as daily, may fail to resuscitate the patient if the rest of the injury is severe. It is noteworthy that in our experience with burns complicated by renal failure, we have never had a survival in a patient in whom renal failure was severe enough to require repeated dialyses and in whom the burn covered more than 30 per cent of the body surface. In patients who die with post-traumatic renal insufficiency, any one of the two above-named features may also be present (obliterative pneumonitis or overwhelming infection). On looking over patients and records, however, it is not difficult to discern those in whom renal failure was the most stubborn initial complexity without which survival might have been attained. Despite all efforts to minimize the problem, hyperkalemia with acidosis is usually the terminal mechanism in renal failure.

4. Sudden massive exsanguinating hemorrhage from an ulcer in the upper gastrointestinal tract is occasionally a terminal event in these patients particularly if given steroids, or who with transfusion have become thrombocytopenic. This is not associated with a diffuse slough of the mucous membrane of the gut, and it occurs in the absence of cortisone therapy although the latter is, of course, dangerous on this account. If prolonged deficiency of blood flow produces enzymatic changes in the gut associated with the loss of viability of the mucous membrane, this might be the manifestation in man of such a tendency; the acid peptic diathesis, so much more prominent in man than in the dog, may serve to focalize this lesion in the upper rather than the lower part of the gut.

5. Finally, there is a small group with direct trauma to a particular organ (particularly the heart, brain, and liver) in which a specific visceral rupture or disruption is incompatible with recovery. Head injury leads the list here.

In all of the aforementioned, prolonged deficiency of blood flow is the cause of diffuse anaerobiosis which produces gradual loss of viability of many tissues; continuous electrocardiographic tracings at the time of death will show that diastolic arrest or ventricular fibrillation are the events which demonstrate death of the patient; a few minutes later the brain

suffers permanent widespread damage due to anoxia, and the patient is said to be dead even though many other tissues remain viable as demonstrated by subsequent study *in vitro* or *in vivo*. All tissues have been dying for some hours; when heart and brain cease, the patient himself is said to be dead; the decay curve of the other tissues continues downward until after another sixty to ninety minutes under normothermic or slow-cooling conditions all of the tissues have suffered irreparable damage.

In such circumstances, with prolonged deficiency of flow to tissues, one finds extensive slowing of the passage of blood in small capillary and postcapillary venules, with stagnation. There is loss of fluid and increase in local erythrocyte concentrations under some experimental and clinical circumstances. These changes in the microcirculation are accentuated by the fact that blood has a non-Newtonian character by which is meant that at low rates of flow (that is, low energy inputs) the blood is much more highly viscous and difficult to move than it is at higher rates of flow. When cardiac output is low, the energy transmitted to the microcirculation is minimal, and this sluggishness of flow associated with aggregation of erythrocyte is noticeable. Anything that increases cardiac output and increases the transmission of pulsatile flow and energy into the microcirculation restores it towards normal. Ordinary blood transfusion in early hypotension, for example, is capable of restoring the microcirculation completely to normal by restoring cardiac output and bringing back to normal the energy input to the capillaries and postcapillary venules. It remains to be seen whether or not such agents as normal saline solution or low molecular weight colloids, which lower the concentration of proteins and erythrocytes in the blood, are of particular usefulness in helping to restore tissue perfusion to normal when stagnation in the microcirculation has been of long duration. Whatever therapeutic improvements may result, the devotion of increased attention to the microcirculation has re-emphasized the physics and hemodynamics of prolonged deficiency of flow in cellular organs.[10,11]

What Has Become of Shock

Where, then, do these developments lead us with respect to "shock" as seen and conceived by Dr. Cannon in 1915? We must conclude that medical science has moved beyond such simplified terminology. To lump this fascinating and challenging group of interwoven ailments, most of which are mutually self-sustaining, some of which are biochemical, some bacteriologic, and some organ-dominated, into one diagnosis such as "shock" is as meaningless as a reference to all patients with brain tumors as suffering from elevated pressure of the cerebrospinal fluid. It is up to the scientists of this decade, given more effective methods than ever for maintaining life in patients and more rigorous scientific methods than formerly available, to discriminate among these various initiating and sustaining factors in tissue anaerobiosis. Only by a realistic view of this confusing and multifaceted picture in man will important new methods of therapy arise.

Where do such considerations leave us as we look at the laboratory model, consisting of the arterial-bled dog with prolonged hypotension and death after subsequent retransfusion? This animal has become the subject of study in many laboratories as the National Institutes of Health and the Office of the Surgeon General have succeeded the Office of Scientific Research and Development, making available large sums of money for surgical laboratories to investigate low flow states under controlled conditions. Although the experiments vary in detail, they all share the common property first noted by Dr. Cannon in the cat, namely, that an animal made hypotensive by bleeding shows a time parameter which is limiting as to survival; if flow and pressure are not restored prior to elapse of that time, the diffuse tissue anaerobiosis is sufficiently severe in producing cellular damage so that resuscitation cannot be attained. If dogs under such circumstances show some improvement in survival with hyperbaric oxygen, low molecular weight colloids, vasodilating drugs, preliminary treatment with antibiotics or the use of energy-rich phosphate compounds, it is only natural and appropriate that such should be tried in man. When evaluated in man, however, the appraisal of any such new therapy must be carried out with careful sequential longitudinal study of each case as a prospective research.

Actually, the resolution of contrasts between rodents, dogs, monkeys, cats, and man is to be sought in a distinction between cellular changes and integrated whole-body responses. Vertebrates subjected to prolonged deficiency of blood flow show cellular changes, anaerobic metabolism, and enzymatic alterations which appear to be common to all species. Turning from cellular respiration and metabolism to a larger view of the whole animal, the differences become very marked; bacteriologic, postural, circulatory, and specific organ arrangements show marked differences between the species. As regards the dog these are most important with respect to the fact that the animal is a pronograde carnivore de-

void of many of the postural reflexes seen in man, diffusely colonized with micro-organisms which become active under anaerobic conditions, and particularly prone to the development of portal hypertension and bleeding from the gut as well as multiple small myocardial necroses when a period of prolonged hypotension is followed by liberal transfusion.

The particular vulnerability of man appears to be in the lungs rather than in this splanchnohepatic area. In man, attention must be devoted to the pulmonary effects of massive blood transfusion. In the patient cited, 21 L or approximately five times the normal blood volume was infused directly into the right side of the circulation over a period of about ninety-six hours. The lungs are the first capillary bed and the "filter" through which this infused blood is conducted; if rapidly infused, some of the blood transfusion strikes the lungs in virtually undiluted concentration. In the case considered, some of the blood was given without filtration to preserve platelet activity. In any transfusion the possibility of multiple small emboli cannot be ruled out. Whether filtered or not, one is infusing directly into the lungs (by the pulmonary artery, right heart, and great veins) a large volume that may contain microemboli, platelets, or erythrocytes, and that certainly contain immunologically incompatible substances. It is of interest that one group currently working in London[12] has brought forth evidence to show that the use of extremely fresh blood, so common today, carries viable leukocytes directly to the lung which may there initiate a graft versus host reaction manifested a few days later by an obliterative pneumonitis with a large physiologic shunt. These lesions add a ventilatory anoxemia to the diffuse tissue anoxia already initiated by the deficiency of blood flow.

Whatever the ultimate fate of this particular concept, I should like to conclude my brief presentation with a plea to look increasingly closely at phenomena seen in man and to pattern laboratory studies after the realities of surgical care today. It is important to see from what the patient is suffering and what injury we inflict with therapy.

The ancient term "shock" with its connotation of a simple unified mechanism, should be abandoned and ordinary clinical terminology used to describe the events and terminal mechanisms seen after severe injury.

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SKIN HEMANGIOMAS FOUND TO REGRESS WITHOUT TREATMENT

Pediatric Herald 6(7): 1, September–October 1965.

New York. With no treatment other than reassurance of an anxious parent, most cutaneous hemangiomas in children will regress.

This conclusion was reached by two U.S. Navy pediatricians who followed 330 hemangiomas for two to four years in a series of 204 infants and children.

The investigators said that "most important in the conservative approach is the physician's attitude, his interest in the problem, and his relationship with the patients."

They used photographs taken every few months to document regression and found that this "quickly allayed parental anxiety."

The majority of hemangiomas are present at birth or appear during the first month, the physicians said, although a few may not be noted until the first few months. The usual course is rapid growth for the first six to nine months, a stationary period of several months, and finally a gradual period of spontaneous regression.

They noted that one of the earliest signs of regression is the appearance of white-grey streaks on the surface of the lesion. "Recurrent trauma, repeated irritation, and ulceration of these lesions appear to accelerate regression," they observed.

The study found that hemangiomas regressed completely (or more than 50 percent) at this rate: 30 percent at age three years; 60 percent at four; and 75 percent at seven.

The physicians commented on the fact that spontaneous involution in children was reported as early

as 1888, and confirmed in later studies. "Yet considerable diversity of opinion still exists among physicians" regarding management of the common dermatologic condition. Despite the earlier studies, many papers have advocated such treatment as surgery, x-ray, dry ice, injections, and radon seed implants, the authors said. In patients treated elsewhere prior to entering their study, they said they noted "unfortunate complications of irradiation and injection therapy."

"We hold," they concluded, that "conservative management with continued close observation (possibly massage) during infancy will provide an excellent cosmetic result in later years."

CAPT A. M. Margileth MC USN, chief of pediatric service at the U.S. Naval Hospital in Bethesda, Md. and CDR M. Museles MC USN, chief of pediatric service at the Naval Hospital in Portsmouth, Va., presented their findings in a scientific exhibit at the recent meeting of the American Medical Association.

CUSHING'S SYNDROME DUE TO ADRENOCORTICAL TUMOR

11-Year Review of 15 Patients

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During the past decade a number of developments have combined to increase the ease and accuracy with which Cushing's syndrome can be diagnosed and treated. In his classic description of the syndrome in 1932, Cushing[2] emphasized the clinical features of central obesity, osteoporosis, amenorrhea, hirsutism, striae, hypertension and weakness. At that time he attributed these changes to pituitary basophilism. Anderson and her coworkers[1] in 1938 were among the first to present evidence that the probable common denominator in all cases of Cushing's syndrome was hyperactivity of the adrenal cortex. We may now define Cushing's syndrome as a group of clinical and metabolic disorders which result from an excess of cortisol (hydrocortisone).

Apart from the medicinal use of hormones, an excess of cortisol results most commonly from bilateral adrenal cortical hyperplasia under the stimulatory effect of increased secretion of ACTH by the pituitary. The latter may or may not contain an adenoma. In what is probably the next most common situation, Cushing's syndrome results from a nonendocrine tumor which secretes ACTH or an ACTH-like polypeptide.[11] The next most common cause of the syndrome is adrenocortical tumor. This report summarizes our experience with Cushing's syndrome caused by adrenocortical tumor, with special emphasis on precise diagnosis and surgical treatment.

Clinical Material

During the last 11 years at Vanderbilt University Hospital and the affiliated Veterans Administration Hospital, we have had the opportunity to see and treat surgically 15 patients with Cushing's syndrome due to adrenocortical tumor (Table 1). During the same period more than 50 patients with Cushing's disease due to over-production of ACTH by the pituitary and bilateral adrenal hyperplasia have been studied and treated. Ages ranged from 9 months to 63 years; there were three men and 12 women. Many patients presented only a few of the classical findings of the syndrome and even hypertension and obesity were occasionally absent. While the clinical picture alone is sometimes sufficiently clear to establish the diagnosis of Cushing's syndrome, it is fre-

Table 1

Incidence of Classic Clinical Manifestations in 15 Patients with Cushing's Syndrome Due to Adrenal Tumor

Central obesity	14/15
Hypertension	13/15
Impaired glucose tolerance	11/13
Mental aberrations	10/13
Weakness	8/13
Hirsutism	9/15
Osteoporosis	8/15
Ecchymoses	7/15
Edema	7/15
Striae	4/15
Menstrual aberrations	5/9

quently necessary and always desirable to confirm the clinical impression by special studies of adrenocortical function and adrenal-pituitary relationships. Such studies are of extreme importance in differentiating Cushing's syndrome due to adrenal hyperplasia, extra-endocrine tumor and adrenal tumor. In addition, some help may be offered in preoperative differentiation of adrenal adenoma and adrenal carcinoma.

Diagnostic Studies of Adrenocortical Function

Measurement of the daily urinary excretion of 17-hydroxycorticosteroids (the metabolites of hydrocortisone) has proved to be a practical index of cortisol secretion. Normal adults excrete 3 to 12 mg of 17-hydroxycorticosteroids (17-OHCS) in 24 hours and patients with Cushing's syndrome usually excrete in excess of 12 mg per day. Occasionally large and active individuals excrete greater quantities and children typically excrete smaller amounts. The accuracy of the urine collection and at the same time an adjustment for body weight can be obtained by relating the quantity of 17-OHCS to the quantity of creatinine in the urine. Normal individuals excrete 3.0 to 8.0 mg and patients with Cushing's syndrome almost always excrete more than 10 mg of 17-OHCS per gram of creatinine. All of the patients of our series had elevated urinary 17-OHCS levels; the seemingly low values in Cases 1 and 6 are actually markedly elevated when related to grams of creatinine excreted in these small children.

The relations between the adrenocorticotropic hormone (ACTH) of the pituitary and cortisol in normal individuals and in patients with Cushing's syndrome have been studied extensively.[4,6–8,10–12] In the normal individual secretion of ACTH by the pituitary governs the secretion of cortisol by the adrenal cortex. Cortisol in turn has a suppressive effect on the secretion of ACTH. The ACTH-cortisol relationship can be depicted as a servo-mechanism in which cortisol levels tend to be self regulating. In Cushing's syndrome the fact that cortisol levels are elevated indicates that the normal restraint on pituitary or adrenal function is not operating properly. Two possibilities are apparent: either the ACTH secreting mechanism is not restrained by normal levels of cortisol or else the adrenal cortex is no longer dependent on the stimulatory effect of ACTH and secretes excessive cortisol autonomously.

The ACTH suppression test is based on the urinary 17-OHCS response to small doses of a potent synthetic steroid, Δ'–9α– fluorocortisol (ΔFF) or dexamethasone, which has 30 times the potency of cortisol and which, like cortisol, can suppress ACTH secretion by the pituitary.[9] In normal subjects 0.5 mg of ΔFF or dexamethasone every 6 hours causes a drop in urinary excretion of 17-OHCS to less than 2.5 mg per day in 48 hours. In our previously reported study[13] of 30 patients with Cushing's syndrome, all who were tested showed abnormal resistance to the suppressive effect of this small dose of ΔFF. In 23 of 24 patients with adrenocortical hyperplasia, a larger dose of ΔFF or dexamethasone (2 mg every 6 hours) caused a suppression of the daily urinary output of 17-OHCS. This response indicates ACTH-dependent Cushing's syndrome. In patients with Cushing's syndrome due to an adrenocortical tumor, ΔFF and dexamethasone in both small and large doses failed to cause suppression of urinary 17-OHCS output. This absolute resistance to suppression is also encountered in the "ectopic ACTH syndrome" of bilateral adrenal corticalhyperplasia induced by a nonendocrine tumor (certain carcinomas of lung, pancreas, etc.) which secretes ACTH or an ACTH-like polypeptide.[11] Endocrinologic differentiation between Cushing's syndrome caused by an ectopic ACTH-producing tumor and a tumor of the adrenal cortex which produces cortisol autonomously can be made by measurement of the ACTH activity in the patient's plasma. In the ACTH-secreting tumors the patient's plasma ACTH activity is elevated,[11] while a low level of plasma ACTH activity occurs in patients with Cushing's syndrome caused by adrenal cortical tumor.[3]

Other endocrine studies which are helpful in the diagnosis of Cushing's syndrome and in the differentiation between ACTH dependent adrenocortical hyperplasia and adrenocortical tumor include the methopyrapone (SU-4885) test, the ACTH stimulation test and measurement of urinary 17-ketosteroid levels. The drug methopyrapone (Metopirone®) blocks 11-beta hydroxylation in the adrenal cortex and thus impairs the conversion of compound S to cortisol. When patients with Cushing's syndrome are tested with this drug, those with pituitary-dependent adrenocortical hyperplasia show an increased output of urinary 17-OHCS, while patients with the "ectopic ACTH syndrome" have a variable response and those with adrenocortical tumor fail to respond.[9]

These observations can be explained by the con-

Table 2

Results of Adrenocortical Function Studies and Surgical Treatment in 15 Patients with Cushing's Syndrome Due to Adrenal Tumor

Patient	Sex	Age (yr.)	Urinary 17-Keto Steroids mg./ 24 hr.	Urinary 17-Hydroxycorticoids (mg./24 hr.) Basal	ACTH 50u. IV 8 hr.	2nd day ΔFF 0.5 mg. q 6 hr.	2nd day ΔFF 2.0 mg. q 6 hr.	Tentative Diagnosis	Operative Findings	Result
1. L. G.	F	¾	0.65	6.15	—*	—*	—*	?Left carcinoma	Left adenoma	Excellent—11 yr.
2. L. J.	M	48	33	22	26	21	20	Left adenoma	Left adenoma	Excellent—17 mo.**
3. A. D.	F	49	45	17	21	20	—	Right carcinoma	Right carcinoma	Excellent—8 yr.
4. V. W.	F	57	12	23	50	23	27	Left adenoma	Left adenoma	Excellent—6 yr.
5. M. S.	F	39	9	18	19	19	20	Carcinoma	Left adenoma	Excellent—6 yr.
6. V. Mc.	F	11	72	13	18.5	—	24	Right carcinoma	Right carcinoma	Hospital death
7. P. C.	M	5	16.4	15.4	12+	12+	9.5+	Right carcinoma	Right carcinoma	Excellent—3 yr.
8. B. L.	F	46	10.5	18.6	89	40.5	33.0	Right adenoma	Right adenoma	Excellent—3 yr.
9. D. R.	F	50	27	16.0	78	15	14	Adenoma	Bilateral adenoma	Excellent—26 mo.
10. L. T.	F	35	26	16.0	32	27	26	Right adenoma	Right adenoma	Excellent—23 mo.
11. M. S.	F	38	11	17	14	17.6	20	Carcinoma	Right adenoma	Excellent—21 mo.
12. E. R.	M	51	8	25	60	20	18	Left adenoma	Left adenoma	Excellent—17 mo.
13. E. H.	F	63	27	11–121	115	35	56	Left adenoma ? bilateral	Right adenoma, bil. hyperplasia	Excellent—2½ mo. then sudden death
14. M. J.	F	44	5.5	22	51	23	22	Left adenoma ? bilateral	Left adenoma	Excellent—6 mo.
15. S. J.	F	38	18	8–24	13.4	17	18***	Right adenoma	Right adenoma	Excellent—1 mo.

*Not done.
**Died with intestinal obstruction 17 mo. later.
***One week later spontaneous decrease to 1.6 mg./24 hr.

cept that, in Cushing's disease with elevated pituitary ACTH output, pharmacologic blockage by the Metopirone® of cortisol production in the adrenal cortex results in equivalent reduction of the restraining influence which cortisol has on the pituitary output of ACTH. Thus even more ACTH is produced by the pituitary, with a proportionate stimulus to increased steroid production by the adrenal cortex; increased production of compound S is the result and this is reflected by an increase in the urinary steroid end products which are measured as 17-OHCS. On the other hand when an adrenocortical tumor which secretes cortisol autonomously is present, the pituitary production of ACTH is suppressed. If the Metopirone® is given and cortisol production by the cortex is blocked, there is no corresponding response in ACTH output by the chronically suppressed pituitary and thus no rise in 17-OHCS results.[9] The variability in response to Metopirone® in patients with the ectopic ACTH syndrome has been explained by Meador et al.[11] as probably being related to the variation in secretory rate of cortisol in such cases and the corresponding variation in degree of responsiveness or suppression of the pituitary.

The standard ACTH stimulation test offers further diagnostic information. In normal subjects the urinary 17-OHCS response to 8-hour infusion of 50 units of ACTH is between 20 to 40 mg/24 hours. In Cushing's syndrome due to adrenal hyperplasia, in our previous experience, the basal levels were elevated and following ACTH infusion the levels increased to between 30 to 80 mg. In most instances, patients with adrenal hyperplasia responded by excreting more than 50 mg of 17-OHCS/24 hours. On the other hand about half of the patients who proved to have adrenal adenoma have shown an increase in urinary 17-OHCS excretion following infusion of ACTH. Patients with adrenal carcinoma causing Cushing's syndrome are usually unresponsive to ACTH stimulation, although rare exceptions have been recorded.

Clinical and Laboratory Data

Table 2 summarizes the pertinent clinical and laboratory findings in 15 patients with Cushing's syndrome due to adrenocortical tumor. In this series a diagnosis of an adrenal tumor was made preoperatively in each instance. The prediction of whether a tumor was benign or malignant was not attempted preoperatively with realistic intent. However, on six occasions a preoperative diagnosis of adrenal cortical carcinoma was considered on the basis of unresponsiveness to exogenous ACTH. In three patients a carcinoma was found at operation and three patients had benign adenomata. The reverse has not occurred; in every case in which a preoperative diagnosis of benign adenoma was made from the endocrine studies this proved to be correct. With currently available tests those patients with benign adenoma who are not stimulated by ACTH infusion are indistinguishable endocrinologically from pa-

tients with adrenal cortical carcinoma. Another feature of adrenocortical carcinoma is the frequent but not invariable elevation of basal 17-ketosteroid levels. Two of three patients with carcinoma in this series had such elevations.

Preoperative lateralization of an adrenal tumor was accomplished in 12 of 15 cases. In two cases a large tumor was readily palpable (one carcinoma and one adenoma). Every patient had an intravenous pyelogram and intravenous pyelography served to lateralize the tumor in six instances. Retroperitoneal pneumography was reserved for cases in which the tumor was not accurately localized by pyelography or in which pyelographic results were only suggestive. In seven cases a tumor was accurately silhouetted in the retroperitoneal pneumogram with the additive help of tomography. In one patient the tumor was localized by combining pyelography and pneumography. In another, aortography delineated adrenal "tumor vessels" which led to a confirmatory retroperitoneal pneumogram. In the remaining three patients the tumor could not be localized by any preoperative study; large bilateral adenomata were present in one and small left adrenal adenomata in two.

Surgical Treatment

In the first seven patients a transabdominal approach was used for removal of the adrenal tumor. In most of these patients a long transverse or "bucket handle" incision was utilized. This was extended across the costal margin into a lower intercostal space in three patients with large tumors.[14] In the remaining patients we preferred to use the posterior retroperitoneal approach to the adrenal in patients with adrenocortical tumors causing Cushing's syndrome, except when carcinoma has been suspected preoperatively or when anesthetic factors argue against the prone position. We believe that the posterior retroperitoneal approach is associated with less postoperative morbidity than is a transabdominal procedure. After induction of anesthesia and intubation the patient is positioned in the prone decubitus with the table broken at the hips and a firm pillow under the abdomen. Careful bilateral posterolateral incisions of the Hugh Young type are made and each adrenal fossa is explored simultaneously, usually through the bed of the 11th rib. Excellent exposure of each adrenal is provided by this approach. The possibility of bilateral adenoma, as emphasized by Hayes,[5] is accurately confirmed or excluded. Biopsy of the normal or atrophic adrenal contralateral to a single cortical tumor provides corroborative histologic information and a more accurate appraisal of the anatomic status of the glands but is of limited value in predicting the functional status of adrenocortical tissue. However it is a sound principle to make an accurate appraisal of the gross status of each adrenal gland before making a decision to remove one or both glands. In patients suspected of having an adrenocortical carcinoma we prefer to use the anterior abdominal approach with a thoraco-abdominal extension so as to permit a performance of a radical nonmanipulative resection.

Table 2 summarizes our surgical experience with adrenal tumors which cause Cushing's syndrome. Three of these patients had an adrenocortical carcinoma, ten had unilateral adenoma and one had bilateral adenomata. Another patient with a solitary adenoma had coexistent bilateral adrenocortical hyperplasia. The patient (Case 9) with bilateral adenomata had a moderately severe Cushing's syndrome and deserves special comment because her specific pathophysiologic process may possibly represent a separate disease process. On endocrinologic evaluation this woman had Cushing's syndrome with responses to dexamethasone suppression and ACTH stimulation which suggested a benign adrenal adenoma rather than bilateral adrenocortical hyperplasia. Her plasma ACTH levels were low. Preoperative efforts at lateralization of a tumor were equivocal and the diagnosis was adrenocortical adenoma without lateralization. Bilateral adrenal exploration showed large (70 Gm) adrenocortical tumors on each side. These were removed totally and histologically their cellular structure suggested bilateral hyperplasia rather than tumor—this histologic differential, however, is difficult at best. The microscopic sections of the tumors in this patient were reviewed by several pathologists including Dr. Malcolm Dockerty at Mayo Clinic; the distinction between benign adenoma and hyperplasia becomes very difficult in certain cases and in this particular situation the consensus of opinion was that the lesion should be classified according to its functional behavior rather than its purely anatomic aspects. Accordingly, a diagnosis of bilateral adrenocortical adenomata was made. It should be kept in mind, however, that an alternative diagnosis in this unique situation might be a primary bilateral adrenocortical hyperplasia without dependence on ACTH stimulation, either of pituitary or ectopic origin.

In this series of 15 patients the tumor was removed successfully in each instance with a single exception—a child (Case 6) with a massive right adrenal carcinoma which involved the kidney, liver,

inferior vena cava, aorta and retroperitoneal lymph nodes. This patient died in the early postoperative period following a very radical resection. Operative and postoperative complications in the 14 surviving patients included one patient who developed a wound infection, another who had a transient pleural effusion and a third who developed hepatitis 6 weeks after operation and made a good recovery with steroid therapy; operative injury to a ureter was recognized and repaired successfully in another patient and no residual uropathy resulted.

Inasmuch as adrenocortical tumors which cause Cushing's syndrome are autonomous, the patient's normal adrenal tissue becomes relatively atrophic and nonfunctional. Following removal of the adrenal tumor in this series of patients, a careful regimen of adrenal substitution therapy was instituted. In addition, in the early postoperative period brief courses of ACTH therapy were given to stimulate the resumption of secretory function by the remaining adrenal tissue. In occasional instances adrenal substitution therapy was required for as long as 1 to 2 months. In most cases, however, in which unilateral adrenalectomy was performed, adrenal substitution therapy was required for only a few days.

The follow-up period in the surviving patients now extends from 1 month to 11 years. In general, the prominent stigmata of Cushing's syndrome have disappeared. The florid manifestations have regressed quite promptly; however, a complete return to a "normal" status may require several months. Severe osteoporosis and marked mental changes are seldom completely reversible. One patient (Case 13) died at home, suddenly, of unexplained cause 2½ months after apparently successful surgical treatment. Another patient (Case 2) died of intestinal obstruction 17 months following excision of an adenoma; he had been completely relieved of the Cushing's syndrome in the interval. One patient (Case 5) has persistent hypertension and impaired glucose tolerance but is otherwise well. The other 12 patients have been relieved of the Cushing's syndrome; however, two have intermittent psychiatric problems. The two surviving patients who had adrenal carcinoma have been followed 3 and 8 years, respectively, and have no evidence of residual tumor.

Comment and Summary

Fifteen patients with Cushing's syndrome due to adrenocortical tumor have been studied and treated surgically during the past 11 years. Many of the patients presented with only a few of the classic clinical manifestations, and precise studies of adrenocortical function were often required to establish the diagnosis. Through these studies it was possible to determine with accuracy that the Cushing's syndrome was the result of adrenal tumor rather than bilateral adrenal hyperplasia secondary to pituitary or ectopic ACTH overproduction. A precise preoperative diagnosis of adrenal carcinoma was made in three patients. In 12 patients with a benign functional adenoma, a preoperative diagnosis of adrenal tumor was made in each instance, and on eight occasions it was possible to designate the tumor accurately as an adenoma. In the other three cases of benign adenoma, the preoperative studies indicated adrenal tumor but did not allow endocrinologic differentiation between carcinoma and adenoma. There was no strong reliance on preoperative endocrinologic efforts to differentiate between adrenal carcinoma and adrenal adenoma. This study, however, demonstrated that preoperative endocrinologic differentiation between adrenocortical tumor and hyperplasia has achieved great reliability. Localization of the tumor was accomplished before operation by physical examination and radiologic studies in 12 of 15 patients. Failure to localize the adrenal tumor with accuracy prior to operation in three patients, coupled with the frequency of bilaterality of adrenal pathology in Cushing's syndrome, has prompted us to expose each adrenal gland routinely at operation. The bilateral posterior approach to the adrenals provides adequate exposure with less postoperative morbidity than the anterior incisions which we reserve for cases in which carcinoma is suspected.

Successful surgical treatment was accomplished in 14 of 15 patients. Following removal of the tumor the regression of the syndrome is rapid and complete.

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PHYSICAL FITNESS IN THE READY RESERVE

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All personnel of the naval service, regular or reserve,[1] are directed[2] to be "in a state of physical fitness to be prepared immediately to perform duties for periods requiring long endurance under the most trying conditions." For Marines,[3] "it is essential to combat effectiveness that every Marine", regular or reserve, be physically fit. "A minimum of 2½ hours weekly is required to develop and maintain an adequate level of physical fitness through vigorous activity."

To determine the level of fitness among reservists a study was made of 509 Marine infantry or combat engineer troops. All were undergoing annual field training at an Amphibious Training Command during late June and early July, 1965. 18 were officers; 39 were sergeants (E–5 to E–9); and 452 were in lower enlisted ranks. They were members of Organized Reserve units located in five eastern or midwestern cities ranging in size from 80,000 to 200,000 and in one eastern metropolis.

Results

Comparatively few of these men were found to engage regularly in sports or physical conditioning exercises or to be employed in occupations which might be expected to contribute to development of physical strength or stamina.

Six percent of the reservists habitually engaged once a week or more often in a sport or sports appropriate to the season the year around. Sports participation during a part of the year was reported by 42 percent of the men from the five smaller cities; 23 percent of the men from the metropolis; and 39 percent of all 509 men.

Twelve percent habitually engaged in physical conditioning exercises, including running, three times a week or more often which is the minimum required for effect.[4]

Twenty percent of all individuals studied were employed in occupations which the investigator believed likely to contribute to development of physical fitness.

Performance of men was observed while they climbed debarkation nets and traversed an obstacle course. On the latter, the average reservist was able to get through 18 of 24 obstacles. 32 percent of the men traversed all 24 of the obstacles.

Poor performance on debarkation nets and the obstacle course was displayed by a large proportion of men who appeared overweight or were overweight by Department of Defense standards.[5] All 509 of the men were actually weighed during the study. Only 1.4 percent were overweight according to standard tables for height and age[5] but many more looked obese and performed poorly. A very small proportion of overweight individuals are extremely muscular and are likely to perform well.[6]

A surprisingly high proportion of reservists were subject to physical disabilities resulting from civilian activities during the year which preceded annual field training, and which disqualified them for military duty. A company with average annual strength of 100 men was studied in detail in this connection. During the year 50 men left the company for non-medical reasons and were replaced. 14 more men, during the same year, developed physical disabilities of non-military origin which disqualified them for military duty and required[7] their temporary or permanent transfer out of the Ready Reserve. Most disqualifications resulted from sports injuries and auto accidents. A few were due to industrial trauma and a few to illnesses of non-traumatic origin.

Most of the reservists studied did not have civilian occupations or habits of sports participation and exercise which promote physical fitness. The need was shown for reservists to improve their strength and

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stamina by engaging in sports and in habitual, progressive, individual exercise programs[4, 8–10]. The study confirmed the opinion[4] that "modern technology has lessened the opportunity for obtaining sufficient daily physical activity to maintain adequate muscle tone."

Men who were absolutely[5] or relatively overweight tended to perform poorly in arduous events.

During the year preceding annual field training, 14 percent of the average strength of a group which was studied developed physical disabilities of nonmilitary origin, which disqualified them for military duty and required their temporary or permanent transfer out of the Ready Reserve.

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FROM THE NOTE BOOK

IMPLANTABLE ELECTRONIC PACEMAKERS

The more than 10,000 American heart patients who have been fitted with implantable electronic pacemakers need have no fear that the pacemaker will be affected by proximity to diathermy machines, neon signs, household appliances, radios, TV sets, or other electrical or electronic apparatuses that generate radiofrequency emissions, the Public Health Service's National Heart Institute, U.S. Department of Health, Education and Welfare, said.

The Institute said that implantable electronic pacemakers manufactured and commercially available in the United States have been repeatedly tested and found completely free of susceptibility to outside radiofrequency interference.

"These tests have shown that, once the pacemaker is implanted within the patient's body, its electronic design and the natural shielding afforded by body tissues prevent any external radiofrequency sources from affecting its performance," Dr. Peter Mansfield of the Institute's Laboratory of Cardiovascular Physiology said.

The Institute's statement was prompted by a recent paper published in the *British Medical Journal* which received wide publicity in the United States. Most of the publicity failed to indicate that the article's findings of radiofrequency interference applied only to two pacemakers of foreign manufacture—one external and one implantable—and not to implantable pacemakers manufactured in the United States.

Electronic pacemakers generate electrical signals that cause the heart to beat at a normal rate in patients whose normal pacemaker function has been disrupted by heart disease or operative injury. Those currently in clinical use in the U.S. are completely implantable and are powered by long-life batteries that need replacement only every few years. These devices have saved thousands of lives and have enabled other thousands of heartblock victims to resume active lives, the Institute said.

The National Heart Institute is one of the nine National Institutes of Health of the Public Health Service, USDHEW—HEW-G14, July 27, 1965.

STUDIES ON MURINE LEUKEMIA

Rich, Marvin A., Albert Einstein Medical Center, Philadelphia, Geldner, Janice, and Meyers, Paul. J Nat Cancer Inst 35(3): 523–536, September 1965.

A virus capable of inducing leukemia in rodents is described. The agent, morphologically similar to other murine leukemia viruses, induced lymphoid leukemia in a variety of mouse strains and in Osborne-Mendel rats. Although leukemogenic activity was inversely proportional to age, Swiss mice up to 6 months of age could be infected. Measurable infectivity could be demonstrated after exposure to 56°C for up to 1 hour. Virus was inactivated by formalin and ethyl ether. The virus could be propagated in cell cultures of mouse embryo without cytopathogenicity. Comparison with Moloney leukemia virus by the cell-specific antigen technique suggested antigenic differences. Cytotoxicity tests indicated that, unlike the Friend, Moloney, Rauscher, and Gross viruses, the virus described here shared cytotoxic antigens with all the other four. Vaccines prepared with this or Friend virus protected mice from the leukemogenic activity of this virus. Low concentrations

(1,256) of antisera prepared against this virus neutralized high titers of virus. Cross reactivity with Moloney, Friend, and, to a lesser extent, Rauscher virus was observed. The current status of the relationship between the murine leukemia viruses is discussed.

RECOVERING THE USE OF PARALYZED LIMBS

A new phase of a research project aimed at finding a way for people to recover the use of paralyzed arms and legs is under way at the Case Institute of Technology in Cleveland, Ohio.

The Vocational Rehabilitation Administration of the U.S. Department of Health, Education, and Welfare expects to make grants totaling approximately $1,000,000 to help support the project over the next five years, Miss Mary E. Switzer, Commissioner of Vocational Rehabilitation, announced.

The VRA grant for the first year will be approximately $200,000. Case Institute's share for the same period will be about $95,000.

Case Institute scientists hope to transmit electric impulses from a computer-tape recorder system to tiny receivers implanted in the muscles of a paralyzed limb, the purpose being to activate the muscles. For example, a person with a paralyzed arm would give a signal to the tape recorder and thus be able to put his arm through such motions as lifting a glass of water, brushing his hair, or cleaning his teeth.

In the first phase of the project, Case Institute researchers developed a means of maneuvering an arm encased in a metal splint framework by sending electric impulses from a tape recorder to motors in the framework. Now the Case scientists hope to directly activate paralyzed arms and legs.

Both phases of the project have been directed by James B. Reswick, Professor of Engineering and Director of the Engineering Design Center at Case Institute.—HEW-G36, Aug 13, 1965.

ACCURACY OF ROENTGENOLOGIC EXAMINATION IN DETECTING CARCINOMA OF THE COLON

J. D. Lauer, H. C. Carlson, and E. E. Wollaeger. Dis Colon & Rectum 8: 190-197, May-June 1965. From Mayo Clinic Proceedings 40(9): 734, Selected Abstracts, September 1965.

A study undertaken to determine the accuracy of barium-enema examination in detecting carcinoma of the colon was divided into two parts: (1) to determine the accuracy of barium-enema examinations in cases of proved carcinoma of the colon and (2) to determine the likelihood of false-positive reports of carcinoma based on such examinations. Of 707 cases in which lesions histologically proved to be carcinoma of the colon were located above the region of proctoscopic visualization, the lesion was either missed or misdiagnosed in 49 cases, an overall diagnostic error of 6.9%. If one excludes those carcinomas found but misinterpreted, those associated with chronic ulcerative colitis, and those recurring at anastomoses, the diagnostic accuracy in this series was 95.9%. Of 577 cases in which a roentgenologic diagnosis of carcinoma of the colon was made, false-positive diagnoses were made in five cases, an error of 0.87%. The difficulties in detecting carcinoma of the colon by barium-enema examination are discussed. The overwhelming majority of the lesions missed were located either in the cecum or the sigmoid colon.

TESTING FOR DIABETES

More than 700,000 Americans were blood tested for diabetes in fiscal year 1964 and almost a million persons will be tested during the fiscal year 1965, the Public Health Service, U.S. Department of Health, Education, and Welfare, reported.

The Service said that the 705,324 persons who were screened during fiscal year 1964 represented an increase in screening of 34 percent over fiscal year 1963. It estimated that there will be a similar increase during fiscal year 1965.

Despite the increase in screening, an estimated 2 million persons still have undetected diabetes, according to Dr. Glen W. McDonald, Chief of the Diabetes and Arthritis Program, Division of Chronic Diseases. Dr. McDonald and his staff compiled the data based on screening results reported to the Service by 33 States and Puerto Rico.

The data showed that during fiscal year 1964, the proportion of people who screened positive to the test remained almost the same as in 1963—44 persons per 1,000 tested. The rate of new cases also remained about the same as in fiscal year 1963—8.6 per 1,000 persons tested.

While the number of people who were screened increased dramatically, Dr. McDonald stressed that screening programs throughout the United States

should place increased emphasis on testing older people, the overweight, those with a family history of diabetes, and those with symptoms of diabetes.

"Since approximately one-half of the diabetics in this country are undiagnosed, it is essential to concentrate on screening those groups that will produce the greatest number of cases," he said.—HEW-F80, June 30, 1965.

NAVAL MEDICAL RESIDENCIES TO START EARLIER

The Bureau of Medicine and Surgery is desirous that most of its medical officers begin their residencies earlier in the year than has been the case in the past. Late starting has resulted from general shortage of medical officers, the difficulty in having reliefs report early and the deployment of combat ships or units.

The late arrival of specialists who have just completed residencies has sorely taxed the ability of the activities to which they are reporting in accomplishing their missions. A resident finishing late has been confronted with problems in relation to children changing schools, inability to obtain certain desired billets, and in some cases, inability to obtain government quarters due to late arrival.

BUMED intends to take aggressive action to solve this problem along the following lines:

(1) Commanding Officers will be urged to release prospective residents early, not waiting for relief unless absolutely necessary.

(2) BUMED will select reliefs for prospective residents on the basis of early availability.

(3) Orders into residencies will authorize a minimum of leave in route.

(4) Future residents will be urged to take a minimum of the leave authorized prior to reporting.

DENTAL SECTION

Naval Dental Research Reports

Abstracts of the 11th and 12th report of the Navy's intramural research program, delivered at the 43rd General Meeting of the International Association of Dental Research, are reproduced here with permission of the Editor, Journal of Dental Research. The first of these two reports relates to abstract (5) of this series. T. S. Meyer, M.S. (Biochemistry), and B. L. Lamberts, Ph.D. (Biochemistry), are civilian scientists on the staff of the Dental Research Facility, Great Lakes. CAPT P. J. Boyne, DC USN, is studying the use of preserved tissues in oral surgery. Having previously served at the U.S. Naval Dental School and as a guest scientist at the Naval Medical Research Institute, CAPT Boyne recently completed a tour of duty as Dental Officer in the USS BON HOMME RICHARD. In May 1965, he assumed his new duties as Head of the Dental Department, Naval Medical Research Institute. In the subject report, Dr. Jaime Yrastorza collaborated with CAPT Boyne under support of an Office of Naval Research grant, while a graduate student at Georgetown University. Dr. Yrastorza, an oral surgeon, is currently practicing in Colorado.

A COMPARISON OF VARIOUS STAINS FOR HUMAN PAROTID SALIVA PROTEINS SEPARATED BY ACRYLAMIDE GEL ELECTROPHORESIS

T. S. Meyer and B. L. Lamberts, Dental Research Facility, Great Lakes, Illinois.

Various stains were compared with the commonly used amidoblack 10B in an effort to improve the visualization of parotid saliva proteins separated by acrylamide gel electrophoresis. The following stains were tested: Aniline Blue, Aniline Blue Black, Azocarmine G, Bromphenolblue, Coomassie Brilliant Blue, Light Green SF, Nigrosis, Ponceau R, Ponceau S, Procion Brilliant Blue, and Wool Fast Blue BL. The comparisons were made on individual or pooled collections of paraffin-stimulated parotid saliva from healthy naval male recruits and on crystalline parotid saliva amylase. All electrophoresis experiments were performed in 5 percent acrylamide gel with 0.1 M Tris-EDTA-boric acid buffer at PH 9.0. The finished gel was treated with a 0.02, 0.1, 0.5 or 1.0 percent solution of the stain in a mixture of methanol, water, and glacial acetic acid (5:5:1) and the excess stain was removed either by rinsing with the same solvent blend or electrophoretically with 3.75 percent acetic acid. Wool Fast Blue and

Coomassie Brilliant Blue greatly improved the visualization of the electrophoretic patterns of cathodically-migrating proteins. These stains also permitted electrophoresis with much lower concentrations of parotid saliva proteins than is normally required for amidoblack 10B.

OSSEOUS REPAIR OF THE POST EXTRACTION ALVEOLUS IN MAN

Philip J. Boyne and Jaime Yrastorza, Naval Medical Research Institute, Bethesda, Md., and Wheatridge, Colo.

Recent fluorescent microscopic investigations of post-extraction healing in dogs have demonstrated the existence of hitherto unreported osseous repair phenomena occurring in "extra-alveolar" areas. The purpose of this study, was to observe histologically by means of tetracycline induced fluorescence, the osseous repair phenomena associated with healing of the human post-extraction alveolus. Twelve clinical patients presenting for full maxillary tooth extraction were selected for this study. One maxillary first bicuspid was removed in each patient. At selected postoperative intervals tetracycline was administered to the patients in order to chronologically orient the osseous healing processes. At the time of extraction of all remaining maxillary teeth biopsies were taken containing the entire bicuspid socket with the surrounding bone. Bony defects were grafted with freeze-dried homogenous bone to restore contour. Ground undecalcified sections were studied by ultraviolet microscopy. Tetracycline labelling at 7 days postoperatively demonstrated marked new bone formation in the marrow vascular spaces but no osseous matrix in the socket itself. The first evidence of bone formation associated with alveolar healing occurred along the endosteal side of the lamina dura. The first bone formation in the socket itself occurred 9 days after extraction. Initial new bone matrix in the alveolus was observed along the lateral aspect of the socket and not in the fundus as frequently described. The results of this study would indicate that various extra-alveolar and intra-alveolar repair phenomena observed in experimental animals also occur in man.

DENTAL PULP HEMOGRAM

Guthrie, T. J., McDonald, R. E., and Mitchell, D. F., Jour Den Res 44(4): 678–682, July–Aug 1965.

On the basis that the degree of success of vital pulp therapy can be increased by more critical selection of cases, it becomes of paramount importance to know the status of the pulp one is attempting to treat by pulp capping or pulpotomy. This study was designed to compare the commonly used clinical diagnostic methods with the pulpal white blood cell differential count, as measures of the true status of the pulp in a tooth with an extensive carious lesion. The local pulp hemogram was compared with the histologic picture of the same pulp tissue, and with a sample of peripheral finger blood. Fifty-three teeth with carious pulp exposures were compared with fourteen normal teeth used as controls. Before operative procedures, the history of past pain or discomfort was recorded. In pulp testing procedures, ice was used to determine hypersensitivity to cold, hot temporary stopping (131° F) was used to detect hypersensitivity to heat, and an electric unipolar vitality tester was used. Response to percussion and mobility were also recorded. Under rubber dam isolation, caries was excavated with spoon excavators and large round burs. The exposure size and amount of hemorrhage were recorded. The first drop of pulpal blood and a drop from the pricked finger were stained with Wright's stain, and differential white blood cell counts were recorded. Then the teeth were extracted for histological study.

On the basis of histological findings, the teeth were classified into 28 "good risks" and 25 "poor risks" for vital pulp therapy. The preoperative diagnostic findings and the hemograms were correlated with those histological interpretations of the status of the pulp.

No clear-cut relationship was observed between the dental pulp hemogram and the extent of pulp pathosis. However, some degree of relationship was observed between an elevated pulp neutrophil count and microscopic evidence of pulpal inflammation. The presence in the pulp hemogram of neutrophils exhibiting degeneration and karyolysis appeared to be indicative of extensive pulp inflammation, as was also the occurrence of profuse bleeding at the exposure site. No reliable diagnostic relationships were found in heat, cold, electrical, percussion, or mobility tests relative to the degree of pulpitis. A history of spontaneous pain was a more reliable characteristic of extensive pulpitis than was a history of pain while eating. Teeth with a history of pain at night showed a considerable degree of pulpal inflammation.

CORRECTION AND ADDITIONAL EXPLANATION

In U.S. Navy Medical News Letter 46(6):15, of 24 September 1965, a regrettable typographic omission occurred. In the abstract titled "Clinical Evaluation of Stannous Fluoride in Naval Personnel," on line (10) of paragraph (2), between the words "received" and "a", the following should be inserted: "treatment with the SnF_2 prophylactic paste. Groups A, B and E received". This experimental design is presented more clearly in the table below. In the prophylaxis paste and topical solution, NaCl was used as placebo for SnF_2, for reason of their similar strong salt taste. NaCl was not used as placebo in the control dentifrice because the two dentifrices were indistinguishable by taste and appearance.

Experimental Design

Group	Prophy	Topical	Dentifrice
A	SnF_2	4″ SnF_2	SnF_2
B	SnF_2	4″ SnF_2	Placebo
C	SnF_2	4″ NaCl	SnF_2
D	SnF_2	4″ NaCl	Placebo
E	SnF_2	15′ SnF_2	SnF_2
F	NaCl	4″ NaCl	Placebo

PERSONNEL AND PROFESSIONAL NOTES

AMERICAN DENTAL DIRECTORY, DESIGNATION OF CHARACTER OF PRACTICE. At its April, 1965 session, the Board of Trustees, American Dental Association approved a revised program for the listing of specialists in the 1966 edition of the *Directory*. At its September, 1965 session, the Board of Trustees approved the following resolution: *Resolved,* that the implementation of the April, 1965 directive of the Board of Trustees for the listing of specialists in the *1966 issue of the American Dental Directory* be delayed until the 1967 issue in order to permit the constituent and component societies to complete their portions of the listing program.

The above points have been incorporated in a revised "Statement of Eligibility" form. Dental officers who desire to be listed as in limited practice, within the above policy, may request copies of these forms by letter to Chief, Bureau of Medicine and Surgery (Code 611).

Additionally, a decision of the Judicial Council and requests from constituent societies have led to further revisions of the program which were also approved by the Board of Trustees at the September, 1965 meeting:

1. The Judicial Council at its last meeting reversed its previous position that it is impossible for dentists in the Federal Dental Services to limit practice. The Council now agrees that it is possible for a dentist to establish his eligibility for announcement of a limited practice while in the Federal Dental Services. The Council stated that it believes Section 18 of the Principles of Ethics has equal application to the dentist in the Federal Dental Service and the civilian dentist. The revised policy for listing character of practice in the *Directory* will, therefore, include all dentists in the Federal Dental Services who meet the qualifications and whose applications are signed by the Chiefs of Federal Dental Services. The "Statement of Eligibility for Listing Character of Practice in the American Dental Directory" will now provide for branch of Federal Dental Service and signature of Chief-of-Branch.

2. As there has been some objection by constituents to "certifying" eligibility for listing, and as it is the intent of the revised policy that primary responsibility for notification and certification must lie with the individual dentists, the "Statement of Eligibility" form has been revised to state. . . "It is hereby *certified by the above dentist*. . ." Because this Association must deal with its membership through the societies having jurisdiction over the areas of practice, the signatures of constituent and component secretaries insure that they have had opportunity to inspect each statement.

3. Because the listing of dentists who qualify on the basis of ethical announcement of limitation of practice prior to December 31, 1964, may present some future administration problems, a time limit has been established for accepting applications for listing under this qualification. After December 31, 1967, no further applications on the basis of that qualification will be accepted. This time-limit will allow two years for all dentists in this situation to request listing.

4. It was established that the right of this Association to request "proof of eligibility" is a reason-

able condition and may assist in the administration of the policy for listing in the Character of Practice section of the *American Dental Directory*.

NAVY PARTICIPATION IN ADA AND ASSOCIATED PROFESSIONAL MEETINGS. At the 106th Annual Session of the American Dental Association, 8–11 November 1965, at Las Vegas, Nevada, RADM F. M. Kyes, and CAPT W. Naish served as Navy Delegate and Alternate, respectively, to the House of Delegates. CAPT R. S. Howell attended as Panama Canal Zone Delegate. CAPT R. F. Tuck chaired the Naval Dental Reserve Officers' Meeting. CAPT G. H. Rovelstad served as Vice Chairman of the Research Section. CAPT A. W. Grant served as Vice-Chairman, Section on Oral Roentgenology.

CAPT P. C. Alexander presented a paper titled Periodontal Splints. In a Public Health symposium on topical fluorides, RADM F. M. Kyes served as a panelist and presented a paper titled Navy Experience and Viewpoint. In an Operative Dentistry Forum on the Conservative Approach to Dental Problems, CAPT G. W. Ferguson served as Moderator.

Among table clinics were: Tattoo Your Patient with Good Dentistry by CAPT K. L. Longeway; Kiddies Need Foils by CDR C. A. DeLaurentis; and Specialists Need to do Foils by CAPT T. C. Pablos.

Among the scientific and educational exhibits was Dentistry in the Armed Forces. This joint Armed Forces exhibit was monitored by representatives of each service. Naval Dental Corps monitors were CAPT S. E. Tande and CAPT J. B. Lepley. CAPT Tande served as Chairman of the Armed Forces Committee for production of this exhibit.

In the ADA's continuous motion picture program were five films produced in conjunction with the Naval Dental Corps' training programs. Introduced and monitored by CAPT S. E. Tande, these films were: Periodontal Disease, Prevention and Early Treatment; Preventive Dentistry: Prevention of Oral Disease; Intraoral Roentgenography: Improved Equipment and Technique; Immediate Denture Service: Coordinated Management; and Surgical Endodontics. Included in the closed-circuit television program were three video tapes produced in conjunction with the Naval Dental Corps' training programs. Monitored by CAPT S. E. Tande, these tapes were: Parts of a Removable Partial Denture and Their Functions by CAPT F. J. Kratochvil; Impressions and Casting Procedures for Removable Partial Dentures by CAPT F. J. Kratochvil; and TV Production Technics in Pre-clinical Dentistry by CAPT F. J. Kratochvil and CAPT P. F. Fedi.

CAPT V. J. Niiranen and CAPT J. B. Lepley presented papers before the Annual Meeting of the American Academy of Maxillofacial Prosthetics, held 4 – 5 November 1965, in Las Vegas, Nevada. CAPT Niiranen's paper was entitled The Prosthetist and Audio-visual Aids. CAPT Lepley's paper was entitled Use of Silastic in Somato Prostheses.

CAPT P. C. Alexander, presented a paper entitled Correlations of Roentgenographic and Clinical Evidence of Periodontal Disease before the American Academy of Oral Roentgenology, 5 – 11 November 1965, in Las Vegas, Nevada. CAPT A. W. Grant served as Program Chairman and Moderator, Scientific Session, American Academy of Oral Roentgenology.

DENTAL OFFICER PRESENTATIONS. RADM F. M. Kyes presented a paper entitled Temporomandibular Joint Disorders and Occlusion before the New Orleans Dental Society Conference held 24–27 October 1965, in New Orleans, Louisiana. He also presented a short talk before Naval Reserve Dental Officers of the EIGHTH Naval District during a military seminar held 26 October 1965, in New Orleans.

CAPT T. J. Pape DC USN, U.S. Naval Training Center, Great Lakes, Illinois, presented a lecture entitled, Traumatic Facial Injuries before members of the U.S. Naval Reserve Dental Company 9–6 on 16 September 1965, in Evanston, Illinois. CAPT Pape also presented a lecture entitled Dental Office Emergencies and another entitled Endodontia and Minor Oral Surgery before the 13th Annual Mississippi Valley Dental Meeting on 13 October 1965 in Moline, Illinois.

LCDR J. E. Klima DC USN, of the Great Lakes U.S. Naval Training Center, attended the dental society meeting in Moline and presented a lecture entitled Preventive Dentistry.

CAPT M. A. Mazarella DC USN, U.S. Naval Biological Laboratory, Oakland, California, presented a paper entitled Epidemiological Studies Aboard a Polaris Submarine before a symposium on Recent Developments in Research Methods and Instrumentation on 5 October 1965 at the National Institutes of Health, Bethesda, Maryland.

CAPT G. H. Rovelstad, Dental Research Facility, U.S. Naval Training Center, Great Lakes, Illinois participated in a conference entitled Role of Oral Cavity Research in the Study of Tobacco Used and Human Health sponsored by the Council for To-

bacco Research, USA on 16 October 1965 in New York City. CAPT Rovelstad's role is that of an investigator involved in studies of salivary secretions called to the conference to consider means in which tobacco use may affect salivary secretions or salivary gland function. The benefits to be derived by the Navy is related to the exchange of research information on subjects closely allied to current studies in progress at Great Lakes.

CDR J. J. Thomas Jr., DC USN presented an essay entitled The Effect of Gold Condensation on the Human Pulp before the Annual Session of the American Academy of Gold Foil Operations on 5 November 1965 in Los Angeles, California. CDR L. V. Hickey, U.S. Naval Hospital, San Diego, California, presented a chair-side demonstration of Application of Rubber Dam at the same meeting.

CDR P. V. D. Reitz Jr., and LT S. H. Hardison, U.S. Naval Dental Clinic, Philadelphia, Pennsylvania presented two lectures entitled Distal Extension Partials, and Immediate Complete Dentures before the Lehigh Valley Dental Society on 17 November 1965 in Allentown, Pennsylvania.

CHANGE OF COMMAND AT NDC YOKOSUKA. CAPT W. C. Wohlfarth Jr. recently relieved CAPT D. E. Cooksey as Commanding Officer, U.S. Naval Dental Clinic, Yokosuka, Japan. The ceremony was attended by nearly 200 people which included many distinguished guests such as representatives of various military commands throughout Japan and civilian professional persons including the Mayor of Yokosuka, the Honorable, and Mrs. Masayoshi Nagano.

CAPT Cooksey, who has been appointed SIXTH Naval District Dental Officer, received a letter of appreciation for distinguished service rendered from Admiral T. Nishimura, Chief of Staff, Japanese Maritime Self Defense Force.

YOUNG NAVY DENTISTS OBSERVE SHIPBOARD DRILLS. LCDR J. A. Bodner, Dental Officer, USS FULTON (AS–11), assisted by LCDR J. P. Williams and LT D. C. Eldridge, hosted nine dental officers of the U.S. Naval Submarine Base New London, Connecticut, on 8 – 9 September 1965. In addition to the ship-board orientation which included an opportunity to observe and participate in various underway drills, Doctor Bodner delivered a presentation on current advances in crown and bridge therapy. Those participating in the two day cruise were Lieutenants: G. L. Beeman, S. M. Blechner, J. S. Burrus, E. G. Grace, D. N. Haeger, L. M Hunt, T. W. Littlefield, P. C. Steadman and C. D. Young.

NAVAL DENTAL CORPS OFFERS NEW CORRESPONDENCE COURSE. The Naval Dental Corps is offering a new correspondence course, *Removable Partial Dentures: Planning and Design* (NavPers 10511). The text for the course (NavPers 10485) was written by CAPT A. R. Frechette DC USN (Ret), formerly Commanding Officer, U.S. Naval Dental School, NNMC, Bethesda, Maryland.

The new course offers a brief but valuable review of the general principles underlying removable partial denture design and can serve as a useful starting point for a better understanding of partial denture prosthetics. The text, which is profusely illustrated, analyzes the forces that may damage the teeth and the edentulous ridges and suggests how each part of the denture may be designed so as to limit and distribute these forces.

Removable Partial Dentures: Planning and Design consists of one assignment and is evaluated at 3 Naval Reserve promotion and/or retirement points. Enrollment in the course can be accomplished by applying on form NavPers 992 directly to the Commanding Officer (Code E–43), U.S. Naval Dental School, National Naval Medical Center, Bethesda, Md. 20014. Inquiries regarding eligibility for the course should be sent to the same address.

OCCUPATIONAL MEDICINE SECTION

THE WORTH OF OCCUPATIONAL HEALTH PROGRAMS

A NEW EVALUATION OF PERIODIC PHYSICAL EXAMINATIONS

John V. Grimaldi, Ph.D., New York, N.Y., Journal of Occupational Medicine 7(8): 365–373, August 1965.

In the market place, where business managers face the final test of their decisions, the principal—perhaps only—consideration is what one gets for his money. Unless the purchaser and vendor have a way of measuring values, no transaction is likely, or if a sale is made, it may not fully satisfy both parties.

The fiscal merit of occupational health programs has been difficult to express, and this must be an obstacle to their acceptance. While employers are convinced that, without a health service their expenses would increase, they have no idea what the net savings may be. Moreover, they cannot quantify the effect of alterations in their programs' quality. As a consequence, one sees varying degrees of enthusiasm for plant health services. Some health services are supported unstintingly; others operate on a marginal level. In any event, it is likely that neither the health professional nor his employer are ever certain that the arrangements are properly effective for their situation; but then, neither can say what should be the most practical operating conditions.

Unfortunately there is a maximum of generalizations and a minimum of incontrovertible specifics in the resource material relative to occupational health programs. Lacking most is the means for measuring the program's over-all effectiveness. Even the appraisal of its individual elements is difficult and often is essentially impossible. In some cases there is controversy among authorities, and the employer, who is left with little to guide him but his good sense, often must make a decision that flies in the face of authority.

An important component of occupational health programs that suffers from contradictory opinions of its merit is the periodic health examination. In 1922 the American Medical Association House of Delegates approved the idea of periodic medical examinations of "persons supposedly in health". After more than 40 years, the question is still unsettled as to whether the examinations are practical when their yield is weighed against the time, cost, facilities, skill, and energy required to provide them. Most physicians can report one or more dramatic examples where early diagnosis has prompted life-saving cures. However, no clearcut conclusions can be drawn because of the absence of systematic studies.

The controversy, and its important bearing on effective, practical health programs, has prompted considerable writing by both sides.

REVIEW OF THE LITERATURE

In 1922, in a study of 95,000 physical examinations of 6,000 persons, conducted between 1914 and 1921, it was found that there were 28% fewer deaths among the examined individuals than would have occurred if the normal mortality had been reached. The cost of examination of the 6,000 subjects was approximately $40,000, while the monetary value of the saving of lives was estimated at more than $126,000. Unfortunately, there is no indication in the report of whether this desirable result could be truly attributed to the physical examination. The same study has been described at greater lengths but did not clear up this question.

Two thousand two hundred examinations done over a 4-year period were reported on. The authors agreed to diagnose only those conditions that were producing symptoms or that had a bearing on health at the time or in the future. Thus, 230 separate cases of disease were diagnosed in 2,178 examinations. Some were diagnosed many times, others only once. Frequent significant diagnoses, in descending order, were obesity, osteoarthritis, hypertensive cardiovascular disease, arteriosclerotic heart disease, hypertensive vascular disease, generalized arteriosclerosis, anemia (hypochromic or secondary), duodenal ulcer, polyp of rectum and sigmoid, hypertrophy of prostate, hypothyroidism, and diabetes mellitus. The authors concluded by lamenting the lack of uniformity in reporting of examination results and believed that the effectiveness of periodic physical examinations could be judged more accurately if examiners

were to adopt a uniform system of recording. The report does little more than sharpen the curiosity of those who wonder what precisely the net gain may be from a periodic health examination.

Five hundred executives over a period of 5 years were examined. On the initial examination, 52% were found to have one or more "defects" requiring treatment, and of these defects, 69.8% were not known to exist prior to the examination. Unfortunately, however, the significance of the "defects" was not defined, and the value of the discoveries is not clear.

Reporting on the "investment value" of a physical examination program, referred to the diagnosis of "significant disease", which he defined as any condition which, if not treated, would be expected to cause substantial medical care or hospitalization, excessive sickness absence from work, or death or major impairment of physical or mental capacity prior to age 65. Examination results for 1455 employees are reported in detail. There were 533 original diagnoses of disease; 27% of these involved "significant disease". Eighty-five percent of the diagnoses were made in the absence of symptoms. Thirty-eight percent of the examined group had significant disease, and the examiners believed that 83% of these would benefit from future care. The "investment value" of the program was indicated by an example: 31 diagnoses (less than 3% of the total) were of early rectal growths. Prospective company savings from the treatment of the growths and the avoidance of cancer were estimated to exceed $120,000, a figure more than 4 times the cost of the examination program. However, this cheerful assumption is clouded by the question as to whether so large a benefit, if any, really derived from the examination. The failure to make a comparison with a control group and to test the differences statistically leaves us with nothing more than another appetizing morsel, when something more substantial is wanted.

A 4-year periodic health examination program involving 750 individuals examined annually or biennially was reported. Ninety-seven percent of the subjects were men who held executive positions. New "diseases" (previously not known to be present) were found in 35% of the cases, and 70% of the disorders required treatment. In only slightly over 30% of the newly discovered diseases were there any symptoms attributable to the disease. A critical review was made of annual physical examinations in the automobile industry. It was argued that their practicality is controversial and concluded that scheduled periodic examinations would be most appropriate for (1) those employees having the more hazardous occupations, (2) chronic absentees, (3) the aged, and (4) those requiring special examinations.

Investigators evaluating cancer detection examinations customarily report success in the identification of asymptomatic cancer. A report on 2111 initial examinations of adults conducted by the Department of Public Health and Preventive Medicine of Cornell Medical College and the New York City Department of Health revealed the following:

1. Twenty-seven (1.3%) of the subjects were found to have cancer, even though the group had been pre-screened to exclude persons with symptoms suggesting malignancy.

2. More than half of the subjects found to have cancer were without symptoms. Subjects with asymptomatic cancer constituted 0.8% of all persons examined.

3. Precancerous neoplasms and other lesions requiring care as a precaution against cancer were present in 14.3% of the subjects.

4. Routine proctosigmoidoscopy revealed neoplastic lesions in 5% of males and 3.7% of females on first examination. An additional 2.7% had such lesions on re-examination after approximately 1 year. The significance of these findings to the employer is not clear. Many factors, such as age, education, and the economic level of the persons in the sample, tend to influence the results, and the study may not duplicate an employment situation.

A report on a periodic health examination program, involving nearly 1,000 individuals examined on an annual or biennial basis, indicated that 22% were found to have developed "significant" new disease in the 1-to 2-year intervals since the initial examination. The subjects were mostly executives averaging 50 years of age; ninety-seven percent were men. Significant new disease was discovered in 1 of 3.

A report was made on an executive health program after it had been in operation for 1 year. Major diseases ("one that severely affects health and need not necessarily be related to the specific diagnosis itself") were found in a little more than 25% of the persons examined. This compares with the number (1 out of 3) of significant new diseases discovered in the study reported above. Of the 307 subjects examined, 150 were classified as "normal". In two reports about 5 years later it was stated that the program then included 648 men out of 954 who were eligible. It indicated that about 50% of the in-

dividuals examined had conditions of medical significance, major in themselves or precursors of potentially serious disease. In 16%, the presence of known disease was confirmed; 20% had asymptomatic significant disease, and 13% had significant disease which was symptomatic at the time of examination. The 5-year follow-up revealed that 17% of the persons were cured of the conditions discovered by the examinations, 12% were worse, 6% were dead, 35% unchanged, and 31% improved.

With respect to malignancies, it was concluded that "the less than 1% found in cancer detection clinics would not warrant the time and cost involved in large-scale routine x-ray surveys". The eight malignant tumors detected in the course of the periodic examinations in this series were nearly all associated with definite symptoms. In a further 10-year follow-up of 717 persons, mostly men aged 40-65 years (70% of those eligible), 59% (421) had conditions of major medical significance or precursors of potentially serious disease. Of these, approximately 10% had symptoms which were of concern to them, but a sizable number, 36% were entirely asymptomatic. These investigations, which collectively studied the issue in greater depth than most, regrettably do not relate the findings to the oft-mentioned criticism that the cost of periodic health examination programs exceeds the value.

An appraisal of 1,500 examinations selected at random from 4,224 periodic examinations in the hotel industry also does not relate the results to the costs of conducting the program.

One report concludes that critical scrutiny of the health examination shows it to be practical only for selected groups and individuals, especially those who want the examination and will profit by it. Two hundred subjects were segregated into two groups: those who had never had a health examination before ("newcomers") and those who had a health examination within the past 4 years ("repeaters"). The examinees in both groups were rated with respect to the presence or absence of 20 physical defects. Statistical evaluation showed practically no significant difference between the 2 groups. It was reported that, with respect to fatal diseases, however, almost 4 out of 5 deaths occurring in the United States in 1948 were attributed to a chronic disease and, of these, about ¼ were caused by a disease which could be considered detectable. To what degree the diseases would be amenable to treatment at the time of discovery is moot.

The report describing the results of examinations of 583 persons (296 men and 287 women), again demonstrates that health examinations can result in identification of important diagnostic entities. The sample consisted of "supposedly healthy" people over the age of 45. Cancer was present in 1 out of 146, and other significant tumors were found in 1 out of 18. Significant heart disease not previously recognized was present in 1 of 25. When known heart disease was included, nearly 1 in 10 had some form of heart disease. Previously undiagnosed duodenal ulcers were found in 1 in 58 cases (duodenal ulcers totaled 1 in 20 including known cases). Cases of previously undiagnosed diabetes numbered 1 in 48 (1 in 32 among the known). This study, however, like others does not provide a clear insight into the relative value, to an employer, of such a program, nor does a study of 391 employees examined over a 19-month span and in which 713 abnormalities were diagnosed (534 not detected previously) and 17 employees had conditions definitely considered to be precancerous.

In a critical review of the evidence for and against periodic health examinations covering 45 years, it was observed that physicians have found that from 15 to 45% of supposedly well individuals examined (most of them adult males) had significant diseases or defects of which they were unaware. The report concluded that, even in the best hands, periodic health evaluations may fail to detect life-threatening disease.

In a study of the value of multiphasic screening to determine whether the physical examination revealed disease that was missed by the history or clinical tests, 753 persons were screened. Three hundred ten of these were referred for conditions previously unknown or not under treatment by the family physician; 439 previously unknown or untreated defects associated with major disease were found. Again, however, the relative value of the discoveries with respect to an industrial health program remains for conjecture.

In another study, defects of function or structure were detected in about 60% of executives examined; about 40% of the subjects were unaware of the abnormal conditions.

In the first year of a faculty periodic health examination program, 294 examinations were completed (263 men and 31 women). Eighty-one percent were found to have a total of 465 "significant" defects of which they were previously unaware. In a follow-up study of the second year's results, 269 people were examined (241 men and 28 women). Seventy-five percent were found to have previously unknown significant defects.

One study involved 765 male executives during a 7-year periodic physical examination program. Of these subjects, 199 were temporarily disabled 8 or more consecutive days for causes other than upper respiratory infection or gastrointestinal disturbances on one or more occasions. The disease which produced disability was diagnosed at the periodic examination prior to the disability in 37.1% of the cases; 33.6% of the disabilities were not diagnosed by the examining physician. These were almost entirely acute diseases which did not exist and could not have been anticipated at the time of the examination. The study concludes that the contention that "life-threatening" disease usually is discovered between examinations is not true. However, there was not conclusive evidence that the course of any employee's disease was changed by virtue of the early diagnosis.

An important consideration, when assessing the merits of periodic health examinations, is the extent to which recommendations are followed. None of the reported analyses of health examinations evaluated this effect. Five hundred and seventy-four male executives were studied to determine their degree of compliance with recommendations received at executive health examinations. Recommendations were made to 435 individuals and follow-up information was obtained on 382. It was found that following a single examination, 23% of the subjects failed to comply, 10% partially complied, and 67% totally complied with the recommendations. Compliance was obtained in only 72% of the total recommendations made. Various factors affecting compliance were studied. It was found that although the amount of disease detected and the severity of the disease increased with increasing age, compliance with recommendations decreased. A significant difference was found between compliance with recommendations for previously diagnosed and for newly detected disease entities. No significant difference could be detected between compliance with recommendations for more significant and for less significant disease, for diagnostic as opposed to therapeutic recommendations, or for medical as opposed to surgical recommendations. The problem of partial compliance was studied, and it was found that, as the incidence of recommendations per individual increased, compliance increased. Variation in compliance with recommendations, when categorized by topographical systems, was found to occur, compliance being obtained in only 57% of recommendations involving the cardiovascular system. The effects of repetitive examinations were studied in 141 of the examinees, of whom 109 had 2 and 32 had 3 examinations. It was found that compliance improved significantly and progressively with succeeding examinations.

In a critique of the physical examination program in industry it was observed that, when carefully and selectively applied, the program has only a restricted role in the majority of industrial operations. The report goes on to say that the examination is of comparatively little value in defense of industrial insurance claims; its value of health insurance can be questioned on the record.

PRESENT STUDY

From a review of the literature it appears clear that the examination of hypothetically healthy individuals frequently reveals physical defects which often were unsuspected. The significance of the findings, with respect to the cost of their identification and the value of their contribution to furthering the individual's health, is unclear however.

To an extent which may be greater than is realized, the undefined worth of periodic physical examinations affects the image of the occupational health program and its possibility of achievement. Industrial physicians who do not include the examinations in their programs, imply it is not an important feature, and the omission is treated lightly since its effect is difficult to appraise. On the other hand, proponents of the examinations may appear somewhat impractical to an unsympathetic observer, since the examination's value is not incontrovertibly manifest.

The reservations of cost-conscious physicians and employers generally have relegated the periodic health examination to a special place in occupational health programs where often it is used only in relatively uncommon situations. Thus, employees in certain hazardous occupations and executives usually constitute the population the examinations serve. Whether this is a justifiable limit to impose on periodic health examinations is a perplexing question. It would seem they should be extended to a wider circle of employees if the implications for greater health and safety are valid. This implicit promise also suggests possibilities for reducing the expense of employee illness, which both the employer and the employee bear, in several possible ways. The fact that the examinations are not more widely employed contradicts the logical reason for their existence.

This anomalous situation apparently has been difficult to resolve and doubtless is due to an inability to satisfy critics who assume a pragmatic atti-

tude. However, if the examinations are as effective as their protagonists hold, one should be able to describe their worth in dimensions that can be appreciated by any critic. In fact, it is necessary to do so since, in the business setting, competition makes it imperative to be able to show clearly how an activity contributes to the aims of the enterprise; otherwise it is controverted and its existence jeopardized with consequent reflections on its sponsors.

The absence of easily read dimensions and the challenge this deficiency presents seem clearly implicit in the literature review. In an attempt to overcome the inadequacy, a statistical study was undertaken which compared the medical and surgical expenses submitted by employees participating in the General Electric Insurance Plan. The study tested the assumption that individuals who receive an appropriate physical examination periodically will be better able to maintain a healthy state than those who are not examined. The difference between the examined and unexamined with respect to the hospitalization, doctor fees, and related expenses incurred from year to year was assumed to be an indication of differences in the health status of the population studied. Experimental and control samples were established with relatively good matching of possible extraneous influences.

Periodic physicals have been offered for many years to middle-management employees (i.e., members of the Elfun Society) at the General Electric Company's manufacturing locations in Schenectady. Some have taken advantage of the opportunity; others have not. Thus, there exists in Schenectady a sizable "experimental" group of periodically examined Elfuns and a "control" group of nonparticipants. An Elfun periodic health examination program has never been undertaken at the Fort Wayne plants of the Company. Therefore, a second control group was available, composed of employees with an economic, social, and education level equivalent to Schenectady's and drawn from a community having similar socioeconomic values.

PROCEDURE

The Schenectady preventive health examination was evaluated first. It consists of the following:

1. A thorough, self-administered, health-inventory questionnaire.
2. Physical examination (subject completely disrobed).
3. A 14 × 17 x-ray film of the chest.
4. Audiometric testing.
5. Visual acuity testing.
6. Tonometry for those age 40 and above.
7. A 12-lead electrocardiogram.
8. Urinalysis for albumin and sugar, and microscopic survey of spun-down sediment.
9. Hematocrit and microscopic study of the blood smear.
10. Fixed-end-point blood sugar determination (Wilkerson-Heftman Method).
11. Proctoscopic examination when indicated (i.e., not routine).

The company's Medical Advisory Council appraised these examination units as a "jury of experts" and agreed that the examination would detect diagnostic entities which when corrected would increase the examinees' longevity and decrease high medical expense.

The sampling procedure for the Schenectady group provided a random number of the Elfuns there. One of every 10, drawn from an alphabetical list, was included. Thus the Schenectady sample consisted of 74 Elfun examinees and 26 nonexaminees. For Fort Wayne, all the Elfuns—94 members—were included.

The covered medical expenses for the years 1956 through 1963, incurred by each of the employees in the study was obtained from the insurance carrier.

Divers statistical analyses were made, comparing the medical expenses of the Schenectady periodic examinees with those of the nonexaminees and the Fort Wayne Elfuns. The statistical significance of the differences between the averages for each comparison were subjected to the test to determine whether they were truly significant and not merely due to coincidental fluctuations in the data.

FINDINGS

The average expense for the unexamined is significantly higher than the average for the examined. Comparisons between the examined sample and both unexamined groups indicates the average medical insurance claim is substantially higher for the unexamined, with good statistical significance. (The Fort Wayne expenses were adjusted 3% upward. This is believed to be a conservative increment to bring the charges more in line with higher Schenectady costs, according to data provided by the Metropolitan Life Insurance Company.)

As the employee permits time to elapse between his examinations, the average expense appears to increase and approaches the average expense claim for

the unexamined. There appears to be strong reason, statistically, to believe that the favorable claim difference for the examined group—in this comparison —is due to factors that are distinctive and not due to chance.

For the period 1956-1963 it was found that examinees averaged a somewhat higher ratio of claims per person than did the nonparticipants. It might be assumed that this is due to the prompting of examinees to obtain medical care following their examination. However, the assumption seems to be refuted by the observation that the fewest claims per person are filed in the year of examination. The number of claims per examinee tends to increase as the years elapsed between examinations increases and the average for the 8-year span therefore is raised. This conforms with the finding noted above that, on the average, the expense per claim increases with the time lapse between examinations.

Occasions for payment for the treatment of coronary heart disease, circulatory disorders, malignancies, and diabetes in the unexamined sample were somewhat higher than for the examined. The total number of entities per examinee indicated a slightly greater number of occasions for incurring medical expense than for the unexamined, but the lower average expense claim for the examined would seem to de-emphasize the possibility that the comparatively greater number of diagnostic entities portends a likelihood of greater expense.

DISCUSSION

Although many writers have described the efficacy of periodic health examinations, a literature review revealed no evidence that any have measured monetarily the examination's worth. Some have spoken of an inherent investment value, but the relationship between the cost of periodic examinations and their possible effect on the individual's medical expenses, as a function of the examination's effect on health maintenance, appeared unexplored. The issue has significance since some writers challenge the merit of periodic physical examinations on such practical grounds.

In order to gain some insight into this cost-result relationship, a comparative analysis was made of examined and unexamined employees' medical expenses, over an 8-year span. Differences between an experimental (examined) group and two control (unexamined) groups were statistically tested. The comparisons indicated that:

1. The number of medical insurance claims per examined claimant increases with the time between examinations.

2. The smallest number of claims occurs during the year of examination.

3. The difference between the examined and unexamined, with respect to the average number of claims per claimant, is negligibly small.

4. The medical expense per claimant increases as the time between examinations increases.

5. The average claim is greater for the unexamined, and the difference tends to exceed significantly the cost per periodic health examinations.

With relatively good statistical probability it is possible to say that the periodic physical examination has demonstrable values for the occupational health program and its employer. The return on investment would seem to be significant when the cost per examination (at our medical centers this approximates $30) is compared with the difference between the medical expense claims for the examined as opposed to the unexamined. In the case of a biennial examination the difference is about $200 per claim.

It appears, therefore, that the periodic health examination should be considered a substantive component of the effective occupational health program and that its individual contributions can be direct and substantial. The examination's implied assistance in disease control, noted in the significantly smaller sickness expense claims for the examined, may be expected to lower insurance costs for both the employer and his employees. Reduced sickness absenteeism rates and maximized employee effectiveness may also be expected to follow.

The study could not delimit practically the effect of differences in personal health motivation. Examinees participated in the examination program voluntarily, and it may be assumed that they possessed a more earnest attitude toward health maintenance, with consequent beneficial effects. A further supposition is that the health appraisal completed at the employer's medical center as opposed to the examination that is not work-oriented, is more searching with respect to the identification and treatment of subclinical, but obviously wholesome stresses, habits, or practices which may inhibit work and the effectiveness of the employee. It is possible that attention to these factors assists the profit objectives of the business as much or more than the advantages observed in the medical insurance costs for the examined employees.

The evidence that claim costs are lower for the

regularly examined, particularly the biennially examined, tends to support findings reported that compliance with recommendations improved significantly and progressively with the subsequent examinations. The personalized opportunity, at the close of the periodic examination, when the doctor communicates his observations, may be expected to have an important influence in this respect.

The values implicit in the Schenectady periodic health examination probably are greater than the data imply. Many of the employees in the unexamined samples undoubtedly obtained periodic physical examinations from time to time at outside diagnostic centers. Their experience might be expected to have modified the data to favor the unexamined groups. The significant medical expense differences for the examined, therefore may be more remarkable.

This study will be followed by another to validate the findings, but its implications are clear that occupational health programs assist the profit objectives of the business in ways that can be measured and the important periodic health examination component of the program may provide direct savings which exceed any expected.

EDITORIAL DESK

AVAILABILITY OF PSYCHIATRIC RESIDENCIES IN NAVAL HOSPITALS

The Neuropsychiatric Branch announces the availability of a limited number of vacancies in the approved Navy psychiatric residency training program. Each year there are only twelve openings for Navy psychiatric residents beginning at the first year level. The Navy hospitals which have residency training programs in psychiatry are Bethesda, Maryland; Oakland, California; and Philadelphia, Pennsylvania. Currently, Bethesda, and Oakland are fully approved for the required three years' training. Philadelphia is approved for two years' training (the third year being given at Bethesda); plans are underway for obtaining approval for third-year training at Philadelphia to bring the program there up to full accreditation.

Prospective residents often ask whether any Naval hospital can offer completely satisfactory residency training utilizing its own facilities and at the same time meet the requirements of the review committees of the various national approving and accrediting bodies. The same question could be asked of any hospital, civilian or military. The Navy's psychiatric residency training program, as necessary, affiliates with local civilian psychiatric facilities in rounding out certain aspects of the training program. Affiliation with state psychiatric hospitals affords extensive experience with chronic hospitalized psychotic patients. Full time assignments may also be made in one or more of the three programs for the purpose of acquiring experience in neurology, in psychiatric outpatient clinics and in child guidance clinics. Civilian consultants also participate extensively in the program by conducting regular seminars and supervising long term therapy cases. The training experience in Navy hospitals includes inpatient and outpatient psychiatry ranging through the entire diagnostic spectrum. Types of therapy taught and utilized include all that are available, i.e., individual and group psychotherapy, chemotherapy, somatic therapy, occupational, and milieu therapies. Both male and female patients of all ages are seen for evaluation and treatment as indicated. Each training hospital is located in a metropolitan area where there are available academic lectures, short courses, and medical schools with excellent psychiatric departments. The psychiatric training program is further enhanced by relevant research programs of considerable variety. Thus, it can be seen, the resident is exposed to and guided through an extensive range of clinical and academic psychiatry.

Upon completion of residency training, psychiatrists have available a wide variety of assignments offering diverse opportunities and challenges, ranging from assignment to the staff of neuropsychiatric training hospitals to duty as psychiatrist with a Marine Division. Each of the assignments includes ongoing professional experience as well as increasing responsibilities commensurate with the individual's training, experience and motivation. Tours of duty are relatively stable, depending upon the individual situation and needs of the service. The career Navy psychiatrist can expect to progress to Board certification, again depending upon his own motivation, and to increasingly responsible assignments up to Chief of the Neuropsychiatric Service of a residency training hospital.

The Surgeon General's Consultant Panel in Neuropsychiatry includes the following members who are prominent in their fields. Members of the Panel provide ready sources of assistance and guidance in dealing with all aspects of Navy neuropsychiatry.

Francis J. Braceland, M.D.
Editor
The American Journal of Psychiatry
1700 18th Street, N.W.
Washington, D.C. 20009

Howard P. Rome, M.D.
Head, Psychiatry Section
Mayo Clinic
Rochester, Minnesota
(and President of the American Psychiatric Association)

Cecil L. Wittson, M.D.
Dean, College of Medicine and
Chairman, Department of Neurology and Psychiatry
University of Nebraska
College of Medicine
602 South 44 Avenue
Omaha, Nebraska

Augustus S. Rose, M.D.
Professor of Medicine
Division of Neurology
School of Medicine
The Center for the Health Sciences
Los Angeles, California 90024

Ewald W. Busse, M.D.
Chairman, Department of Psychiatry
Duke University Medical Center
Durham, North Carolina

Applications are reviewed by the Surgeon General's Advisory Board which selects residents for training. Although most residencies start in July of each year, for some years residents have been started in psychiatry at other times of the year varying with vacancies available at individual hospitals which result from completion of residency training by other individuals. Inquiry for further details can be made directly to this office. We invite those interested to write to:

Neuropsychiatry Branch (Code 313)
Bureau of Medicine and Surgery
Navy Department
Washington, D.C. 20390

SECNAVNOTE 1650—CASH AWARDS FOR MILITARY PERSONNEL

1. The President has signed public law 89–198. This law authorizes cash awards of up to $25,000 to military personnel for suggestions, inventions, or scientific achievements which contribute to the efficiency and economy of government operations.

2. All military personnel will be informed that the law has been passed and that worthy contributions—suggestions, inventions, scientific achievements—submitted now are eligible for award consideration.

3. The suggestion form NAVEXOS 12450/8 (REV. 3–64) used by civilian personnel may be used for submitting contributions by military personnel. Where these forms are not available, such as aboard ship or at activities not employing civilian personnel, contributions will be submitted in writing to the commanding officer, identifying the suggester by name, rank, and serial number.

4. Instructions concerning the processing of contributions and appropriate award scales will be issued as soon as developed by the Navy and Marine Corps.

DIRECTOR, NAVY NURSE CORPS VISITS NAVAL SCHOOLS COMMAND, NEWPORT, R.I.

CAPT Ruth A. Erickson, NC USN visited the Naval Schools Command, Newport, Rhode Island on Friday, 8 October 1965, to participate in the graduation exercises of Class 602–N.

Seventy-four Nurse Corps officers and one Medical Service Corps officer comprised the graduating class.

During the morning activities CAPT Erickson officiated as reviewing officer while all companies of the Naval Women Officer School passed in review. At the afternoon graduation ceremony the Director of the Navy Nurse Corps was guest speaker for the occasion. CAPT Erickson discussed the implications of the 3 R triad of commissioned rank (Respect, Responsibility and Reward) for the newly appointed officers. Following her address, she administered the oath of office to 59 former Navy Nurse Corps Candidates and presented certificates to all members of the graduating class.—Nursing Division, BuMed.

NAVY MERITORIOUS CIVILIAN SERVICE AWARD

Mrs. Mullie F. Jack, technical publications editor in the clinical research facility at Oakland Naval

Hospital for the past 18 years, has received the Navy Meritorious Civilian Service Award "in recognition of her many noteworthy contributions, which have been of high value and benefit to the Navy." It is the first time an employee at the hospital has received the award—a gold pin and a handsome certificate, with a letter from the Navy Surgeon General.

The award was presented to Mrs. Jack by RADM Harold J. Cokely, hospital commanding officer, before a large group of fellow-workers and friends. It came simultaneously with her retirement September 30 at the age of 70.

In presenting the award RADM Cokely noted that Mrs. Jack has prepared papers for submission to 96 different scientific journals and distributed 6,000 reprints requested by doctors in all parts of the United States and 59 foreign countries, thus greatly enhancing the hospital's professional reputation.

Prior to her employment at Oak Knoll Mrs. Jack held government jobs with the War Industries Board in Washington, D.C., and with the Army and Marine Corps in San Diego. For six years she was stenographer and interpreter for the Division of Fruitfly investigation in Mexico City, Mexico. She also did volunteer work for the British Office of Information, Mexico City.—Public Information Office, U.S. Naval Hospital, Oakland, California 94627.

A MOMENT OF HAPPINESS

Corporal John A. Heffelfinger, USMC, consoles "Debbie" by telling her a story. The four-year-old Vietnamese girl was "adopted" by Navy Corpsman Robert P. Dionne after he treated her infected eye. Dionne was later killed in line of duty, but Debbie, who wears the dog tag he gave her, still comes to the medical aid station to find her American Friend.—Armed Forces Press File, Week of August 29, 1965.

DEPARTMENT OF THE NAVY

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